Market Timing and Corporate Debt Issuance

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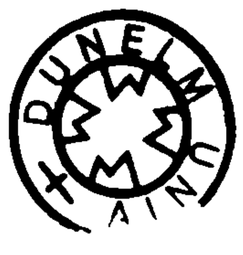

Abstract

This thesis comprehensively examines the relationship between corporate debt issuance and market timing. The focus is on the different issues of debt market timing across the different stages of corporate debt issuance from pre-issue considerations, to implementation and post-issue influences. It also covers different aspects of debt issue decisions including maturity, yield type and issue volume. The thesis starts with an investigation of what motivates debt issue decisions based on the framework of risk management, and finds that timing the debt market rather than hedging the interest rate exposure is the primary motivation for firms choosing yield types and maturities for their newly issued debt. The thesis then explores the information and mechanism behind debt market timing implementation, and finds that managerial market timings of debt issuances are simply responses to fluctuations in market conditions, while their predictions of future market variations are generally unsuccessful. Finally, the thesis examines the influences of debt market timing on capital structure of firms. It was found that, although debt market timing of issue volume results in the abnormal deviation of the debt ratio and impacts on firms' capital structures in both the short and long-term, managers appear to make no effort to reverse the deviations of capital structure. Rather, they continue to time the market afterwards. Therefore, as regards the implications for capital structure, market timing has a long-term influence.

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Table of Contents

Preface

Acknowledgements

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The completion of my PhD study would have been impossible without the moral and financial support of my family. Their encouragement has provided the greatest impetus throughout the period of my study.

I of course accept sole responsibility for any remaining errors.

Author's Declaration

None of the material contained in this thesis has been presented previously as part of any thesis or dissertation submitted for a degree in this or any other university.

Some materials contained in Chapter 2 will appear in the *Journal of Financial Markets* (Antoniou, A., H. Zhao and B. Zhou, Corporate Debt Issues and Interest Rate Risk Management: Hedging or Market Timing, *Forthcoming*)

List of Tables and Figures

Chapter 1: Introduction

1.1. Market timing: A crucial issue in corporate finance

Neoclassical financial theory assumes an efficient market where prices provide accurate signals for capital allocations. In such a market, firms can make production or investment decisions and investors can choose securities under the assumption that capital prices fully reflect all available information *at any time*[1]. In the presence of market imperfections, however, there are temporary windows of arbitrage opportunities before security is accurately priced. Accordingly, the market timing hypothesis emphasizes that the decisions made by firms regarding their financial activities and investors' choices of securities depend on timing. In corporate finance, market timing refers to the financing policy where firms issue securities when the market is overvalued and repurchase securities when the market is undervalued. This notion implies that firm managers have the incentive to benefit shareholders by timing the market if they believe it is possible. Market timing is a crucial issue in corporate finance not only because of market anomalies, but also because behavioural factors influence the financial decisions of firm managers and investors. The existent deviations of capital market valuations affect corporate financing decisions, while market timing influences firms' characteristics and values. If a firm's financing decisions capture the possible opportunities of arbitrage, managerial market timing adds value to that firm. Conversely, if information is promptly and fully communicated in the capital markets or firms fail to make financing decisions incorporating the deviations of market valuation, market timing may destroy firm values. In this sense, the timing issue plays an important role in firms' financing decisions.

A complete explanation of the timing issue in financing and investment patterns requires an understanding of the interaction between two sets of agents, i.e. firm

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[1] See Fama (1970, 1991) for a review of the literature on efficient market hypothesis.

managers and investors. According to this notion, the existing literature regarding market timing can be roughly sorted into three strands. The first of these comprises the empirical studies that have reported clusters of security issuances, including initial public offerings[2], seasoned equity offerings[3] and corporate debt[4], with fluctuations in market valuation. Specifically, firms appear to sell overvalued securities and repurchase undervalued securities[5], and therefore their financing decisions are to a large extent determined by the capital market conditions. This line of literature has investigated capital issuance waves in the circumstance of capital market mispricing, while the majority of these studies have focused on the existence of abnormal market valuation. Therefore, the market-side reason is emphasized as the precondition and the incentive of market timing for security issuance.

The second strand of studies focused on the pattern of market timing behaviour in corporate financing decisions from the standpoint of firm managers who tend to adjust the practical implementation of their financing strategies as market conditions change. For example, Baker and Wurgler (2000), Baker, Greenwood, and Wurgler (2003), and Faulkender (2005) found that firms time debt-equity choices, debt maturity and debt yields respectively. Baker and Wurgler (2002) suggest that persistent historical market timing will shape a firm's current capital structure. Apart from the empirical studies, a number of survey studies such as those of Graham and Harvey (2001), Brav et al. (2005), and Bancel and Mittoo (2004), have provided direct evidence from firms' financial managers regarding

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[2] Among others, Ibboston and Jaffe (1975), Ibboston et al. (1984), Ritter (1984), Ibboston and Sindelar (1988), Ibboston, Sindelar and Ritter (1994), Pagano, Panetta and Zingales (1998), Lerner (1994), and Gompers, and Lerner (2003) found that IPO issuance is positively associated with plausible indicators of market overvaluation.

[3] For example, Stigler (1964), Speiss and Affleck-Graves (1995), Loughran and Ritter (1995), Jung, Kim and Stulz (1996), Hovakimian, Opler and Titman (2001).

[4] Marsh (1982), Barclay and Smith (1995), Stohs and Mauer (1996), Guedes and Opler (1996), and Speiss and Affleck-Graves (1999) found that corporate debt issuance tends to vary with the term structure of interest rates. Unfortunately, none addressed their findings to managers' intention to time the market. However, recent studies, for example, Antoniou et al. (2006, 2008), examine the determinants of debt maturity and capital structure decisions in capital market and bank oriented economies.

[5] A few papers regarding stock repurchases, for example, Ikenberry, Lakonishok, and Vermaelen (1995, 2000), found that the performance of repurchasers is significantly higher than other firms with similar size and book-to-market ratios.

their intentions and practical implementations when timing the capital market. The responses of firm managers to market conditions were the main focus of these studies.

The third strand of studies to emerge recently has examined the interaction between markets and firms as a whole, and explored the rationality of and reasons for managerial market timing based on the general market efficiency and irrational managerial behaviour theories. As a result, a suspicion arises from the evidence *per se*. Following this line of thought, Eckbo, Masulis and Norli (2000), and Eckbo and Norli (2005) proposed an explanation of market timing evidence from the perspective of a risk-return framework. Schultz (2003) and Butler and Grullon (2005) explained the rationality of market timing evidence from the perspective of "pseudo market timing". These studies argue that the "seeming" evidence of managerial market timing is not proof of managers' ability to time the capital markets but rather it is proof of irrational behaviour. For example, Butler, Grullon and Weston (2006) indicated that managers' timing activities are generally unsuccessful at the aggregate market level, while market timing is simply a fair game between firms and investors. Generally, these studies suggest that the issue of market timing in corporate financing needs to be reconsidered by involving both agents simultaneously[6].

The impact of the market timing hypothesis on the development of corporate finance is essential. It is introduced as a crucial factor to explain a large range of financing and investment patterns, while at the same time, there is much room before the field reaches maturity. As describing in the subsequent section, this thesis explores some issues about debt market timing which remains as the gaps in the field.

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[6] Baker et al. (2004) reviewed previous literature regarding behavioural corporate finance sorted by the irrational investor approach and the irrational manager approach separately.

1.2. Issues about debt market timing

As one of two components on the right-hand side of the balance sheet, corporate debt plays a crucial role throughout the life of a firm. Unfortunately, "literature on debt financing patterns is surprisingly underdeveloped (Baker, Greenwood and Wurgler (2003), p.262)." When compared to the equity market, debt market timing, which refers to raising debt when its cost is unusually low, is different in various aspects. Firstly, debt issuance contains specific features which are not involved in equity issues, such as maturity, yield, embedded options, credit rates, etc. These features create more complications regarding debt issue decisions. Secondly, the information on the debt market is less asymmetric. Apart from the private information about credit quality, debt is priced according to the public information of general debt market conditions, while the costs of debt issuance are determined by the variations of market interest rates. Compared to equity markets, where investors and managers interact with each other, debt market timing offers a better chance to examine the manager-side behaviour. There are few findings in the previous studies regarding debt market timing, and the aim therefore of this thesis is to examine the following issues which remain as gaps in the literature.

Most of the literature on corporate risk management has emphasized the role of financial derivatives in hedging various risk exposures[7]. An implicit assumption is that firms that do not use derivatives are not hedging. However, firms could manage their risk exposure by means other than sole derivative usage. Specifically, corporate bonds can be employed as instruments of interest rate risk management based on the immunization strategy. Unfortunately, although widely employed in the interest rate risk management of bond portfolios, its application to corporate risk management has hitherto stayed at the theoretical stage as shown in the textbooks and theoretical papers[8] and has not been examined empirically. Another

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[7] There is a great deal of literature examining why hedging adds value to firms. Among others, Stulz (1984), Smith and Stulz (1985) Froot et al. (1993), Tofano (1996), Geczy et al. (1997), Fok (1997), etc. See details in section 2.2.1.

[8] For example, Chapter 21.7 and 23.1 in Grinblatt and Titman (2002), Chapter 9 in Stulz (2003) and Stulz

assumption of most risk management studies is that firms manage risk exposure primarily for the purpose of hedging. However, recent studies have found that most firms do not systematically hedge their risk exposure (Brown (2001), Guay and Kothari (2003)), and the extent to which they do depends on the managers' market views as regards relevant volatilities (e.g. Bodnar et al. (1995), (1996) and (1998), and Howton and Perfect (1998)). Many firms adopt "profit-oriented and forecast-based" hedging strategies (Glaum (2002)), or in other words, market timing. Deduced from recent studies regarding debt market timing (e.g., Baker et al (2003), Faulkender (2005)), an interesting question arises about corporate debt, that is, whether corporate debt issues are considered to hedge interest rate exposure or firms are engaged in market timing with a view to lowering the costs of capital? Therefore, an empirical investigation of the basic financial instrument --- corporate debt --- and its practical implementations for corporate risk management is needed to bridge the above gaps.

Empirical evidence and survey studies[9] have suggested that firms' financing decisions contain the market views of the managers. However, the market timing hypothesis is still arguable due to multifold implications. For one thing, market timing means that managers make financing decisions based on the available information to accurately predict future market movements. For another, market timing implies that managers try to predict future market movements but may or may not do a better job than others. The supportive evidence for the notion of debt market timing comes from the co-variations of corporate debt issuance and debt market condition variables, while the objections are based on the doubt that managers' have the advantage of market information asymmetry (e.g. Butler et al. (2005), (2006), Schultz (2003)). There is an obvious difference between intention and success in market timing. Therefore, the argument is actually about the divergent understandings of market timing. Clarifying the definition of market

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(1996).

[9] See review of relevant literature in section 1.1 briefly and section 3.2.2. in details, which for reasons of brevity are not repeated here.

timing is a key issue when attempting to fill the gap and associate the two sides of the debate.

How debt market timing influences the financial characteristics of firms remains an open question. If firms do time their debt -equity choices according to capital market valuations (e.g. Tagart (1977), Marsh (1982), Kaplin and Levy (2001), Hovakimian et al. (2001) and Baker and Wurgler (2002)), this would essentially alter their capital structures. With no consensus of the traditional capital structure theories, the market timing hypothesis offers an alternative explanation. However, to what extent managerial market timing, as a behavioural factor, distorts the capital structure of firms in certain circumstances is not yet clear. On the one hand, market timing may affect a firm's capital structure in the long run (Baker and Wurgler (2002)) or only in the short run (Alti (2006)). On the other hand, firm managers treat market timing as an important financing strategy (Graham and Harvey (2001)). The interest here is in the evolution of capital structure under the influence of market timing behaviour and managers' strategies to deal with the distortion. Therefore, an investigation of the influence of market timing on capital structure may create an entirely new theory or introduce a solution that bridges the existing gap between the traditional capital structure theories.

In general, market timing creates a fascinating area where very different views about the interactions between firm managers and investors, and very different normative implications regarding the phenomenon in capital markets introduce a rethinking about corporate finance. However, the lack of an integrated theoretical framework and inconsistencies in the findings reported in the literature provide a strong motivation for further investigation of the market timing hypothesis in corporate financing policies.

1.3. Structure and findings

The aim of the present thesis is to extend the literature by filling the gaps regarding

the above market timing issues as regards corporate debt issuance. Underlying the thesis is the consideration that, when firms raise debt funds for investment projects, various decisions regarding debt financing need to be made. These issues are determined by both internal and external factors. To what extent market timing affects firms' debt issue decisions is the main concern of the present thesis, while the mechanism that is managers' judgements about market conditions and the consequences of debt market timing are also the objective of the study.

The main body of this thesis consists of three empirical chapters. All three of these chapters examine the relationship between corporate debt issuance and debt market timing, while they are each dedicated to different questions as regards debt market timing across different stages of corporate debt issuance from pre-issue considerations, to implementation, and then to the post-issue influences. Specifically, *Chapter 2* investigates the underlying motivations regarding debt issue decisions, and *Chapter 3* explores the information and mechanisms behind debt market timing implementation, while *Chapter 4* examines the abnormal phenomenon of debt market timing and its short and long-term influences on the capital structure of firms. In addition, the chapters are distinguished with each other by focusing on different aspects concerning corporate debt issue decisions. In particular, *Chapter 2* focuses on the choice of the *yield type and maturity* for the newly issued debt, *Chapter 3* examines the variations of *debt maturity* across different market conditions, and *Chapter 4* focuses on debt *issue volume* in the hot debt market. Therefore, collectively, the three empirical studies, constituting the thesis as a whole, comprehensively examine the relationship between corporate debt issuance and market timing.

Chapter 2 examines the hedging effect of debt issuances on the interest rate exposure of firms, determined by either internal or external factors. The preconditional hypothesis is based on the theory that, by effectively designing the maturity structure and choosing the optimal yield type for a newly issued debt, debt

issuance can be used as an instrument of hedging corporate interest rate risks as long as the interest rate sensitivity of the debt is negatively correlated to the pre-issue interest rate sensitivity of the firm's total assets. Based on this assumption, the chapter examines whether firm managers consider hedging interest rate risks when making decisions about debt issuance. This was done by measuring the pre-issue interest rate exposure of the debt issuers by stock price sensitivity to interest rates, and it was found that firm-specific interest rate exposure had little explanatory power over the yield type choices and maturities of the debt issues. Rather, the debt maturity and yield types appear to vary with the indicators of the debt market conditions for both the market aggregate data and pooled firm-level samples. Therefore, the results in this chapter reveal that firms do not use debt issuance as an effective instrument for hedging interest rate exposure as indicated by risk management theory. On the contrary, timing the debt market was the primary motivation when firms chose yield types and maturities for their newly issued debt. Since market timing is actually a kind of speculation on beating the possible opportunities of market imperfections, referred to as "selective hedging"[10], these results are heuristic to corporate risk management with a different theoretical framework other than "volatility minimization". Firm managers tend to maximize firm values by any means, while the costs of hedging risk exposure have to be lowered to a minimum. In addition, yield type choices of debt issues associated to debt market movements add empirical evidence which has been hitherto ignored by the literature regarding debt market timing.

Chapter 3 extends the conclusions of *Chapter 2* [11] and examines whether firms can successfully time the debt market based on the argument in the recent literature[12].

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[10] Stulz (1996) refers to "selective hedging" where firms choose only hedging the "downside" risk exposure but speculating as the volatility adds firm values.

[11] I hereby thank Professor Alexander Butler from the University of Texas at Dallas for his comments on the paper version of Chapter 2 of the present thesis. The fundamental question addressed in Chapter 3, to a large extent, comes from his suggestion regarding the concept of forward-looking market timing.

[12] The argument is whether co-variations of debt issuance and debt market conditions suggest successful market timing. The debate focuses on "psuedo market timing" (e.g. Butler et al. (2005, 2006), Shultz (2003)) and "genuine market timing" (e.g. Baker et al. (2002, 2003, 2006)). See details in the literature review of Chapter 3.

The view in the literature[13] actually mixes the two different concepts of *successfully* timing the market and *trying* to time the market, which emphasize the results and the processes of market timing respectively. In this chapter, "timing" is defined as managers using current and historical information to *successfully* forecast future market variations, in contrast to managers' passive responses to past information. The concepts of *forward market timing*, which refers to the prediction of future market condition fluctuations, and *backward market timing*, which denotes responses to past information, are introduced to examine whether managers possess informational advantages concerning possible changes in the debt market conditions and then take advantage of possible arbitrage opportunities. The hypothesis is that if managers are trying to reduce the costs of their debt capital based on accurate predictions of future markets, it would be expected that they would issue more (less) debt before the costs of the debt issuance implied by the debt market conditions increases (declines). Likewise, if the hypothesis is applied to the pattern of debt maturity, debt maturity is positively related to the subsequent debt market conditions with respect to the costs of long-term debt. However, the empirical results of this chapter suggest that there is no convincing evidence that the firms issued more or longer-term debt before the costs of the debt or long-term debt increases. Conversely, the aggregate debt issue volumes clearly varied as did the relative levels of interest rates compared to their historical levels. This suggests that the managerial market timing of debt issuance is only a response to fluctuations in market conditions; managers do not possess informational advantages over the other market participants and as a result their predictions of future market variations are generally unsuccessful. Therefore, the conclusion links the previous mixed and plausible evidence together and substantially clarifies the argument concerning the timing ability of managers when it comes to debt issuance.

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[13] The majority of evidence regarding debt market timing comes from the identification of the relationship between a firm's debt issue decisions and debt market condition factors, such as term structure. Among others, these studies include Barclay and Smith (1995), Stohs and Mauer (1996), Guedes and Opler (1996), Datta et al (2000) and Baker et al. (2003). For Baker et al. (2003) the favoured explanation is that firm managers are *trying* to time the market.

Traditional capital structure theories provide no universal explanation for the financing decisions of firms, and the influences of market timing on capital structures are unclear. Therefore, *Chapter 4* examines debt market timing with respect to abnormally high issue volumes in the hot debt market, and its short and long-term effects on the capital structures of the issuers. As well as timing the yield type and maturity of the debt issuances, it can be seen that the firms also time their debt issue volume. A hot-market dummy variable was introduced to measure the differences between various corporate financial characteristics in both hot and cold market debt issues. When the debt market is hot, as measured by the aggregate issue volume, firms believe that the market conditions to be desirable in terms of capital cost reduction and tend to issue excess debt which is more than their minimum requirement of capital. The excess debt issues cannot be explained by large debt capacity, fast growth or investment opportunities but are attributable to the timing behaviour. Therefore, the hot debt market captures the market timing intentions of firms. As a consequence, the debt ratios of hot market debt issuers deviate from their pre-issue levels and are significantly higher than those of cold market issuers. More importantly, the hot market effect on issuers' capital structure persistently exists in the long-run. Moreover, the evidence shows that the firms did not appear to make any effort to reverse the deviations in their capital structures. Rather, they continued to time the market in the post-hot-issue period. Therefore, the implication for capital structure is that market timing has a long-term influence in shaping the firm's capital structure. Referred to as the *market-oriented pecking order* hypothesis, these results are consistent with the findings of Baker et al. (2003) that the capital structure of firms is the aggregate outcome of historical market timing. As well as presenting this new evidence regarding the effect of market timing on debt issue volumes, this chapter also extends the traditional capital structure theories by introducing market timing as an alternative explanation.

1.4. Contributions to the literature

In this thesis, each empirical chapter contributes to the literature on debt market timing from specific angles. *Chapter 2* examines the determinants of corporate debt issuance and their effect on the framework of interest rate risk management. The majority of risk management studies have focused on the financial derivative instrument, while the theoretical hedging function of corporate debt as a basic financial instrument has not been examined empirically. This chapter fills that gap by examining the underlying attitudes of managers to hedging interest rate exposure when issuing debt. Market timing, rather than hedging, in corporate debt issuance reflects the large gap that exists between risk management theory and practical implementations. Moreover, in contrast to the traditional risk management theory, the empirical evidence in this chapter suggests that "value maximization" or "selectively hedging downside risk exposure" rather than "volatility minimization" is in fact the underlying motivation of corporate risk management implementation. Furthermore, the evidence of timing debt yield types contributes to the growing field of market timing theory. As most of the previous evidence is concerned with debt maturity, the findings of debt yield timing suggest that market timing is a comprehensive issue concerning corporate financing policies and should also be considered in various aspects of the financing decisions of firms.

Chapter 3 extends the literature based on the recent hot debate regarding the effect of market timing on corporate debt issues. Since there is a gap in the literature regarding whether the significant relationship between the co-variations of corporate debt issuance and debt market conditions captures the market timing intentions of firms, by distinguishing two different directional forms of market timing (forward and backward-looking) this chapter examines whether managers possess informational advantages and are capable of taking advantage of the windows of arbitrage when timing the market. The evidence here suggests that the firms were passively responding to past information about market condition

fluctuations rather than successfully predicting future variations of the debt market. This notion explains the mixed and plausible evidence of debt market timing in the literature, and bridges the gap between the market timing hypothesis and the efficient market hypothesis. In addition, as well as the aggregate macroeconomic data, a large firm-level sample consisting of more than 17,000 new corporate public debt issues covering the period 1970 - 2006 offers a convincing basis from which to comprehensively examine debt market timing while accounting for important bond features and firm-specific financial characteristics.

In *Chapter 4*, a new fact of managerial market timing on debt issuance is described. Among the studies examining debt market timing, the overwhelming majority have focused on debt maturity, with only a small proportion investigating debt yields[14], while debt issue volumes have been ignored completely. This chapter examines the hypothesis of excess debt issuance in hot debt markets and finds that debt issuers regard hot markets as windows of opportunities to reduce the costs of capital. The extent to which the market is hot determines the market timing behaviour, and reflects firms' desires and actual activities as regards debt issues. Therefore, this chapter contributes new evidence of debt market timing in hot and cold-markets from the aspect of debt issue volume. More importantly, with the absence of a universal capital structure theory, it sheds some light on the implications of market timing for the traditional framework of capital structure theories. It investigates how firms adjust their capital structure in the short and long-term when the debt ratios apparently deviate from normal levels due to market timing activities. It was found that market timing played an important role in the financing policies of the firms, and that their persistent behaviours in timing the hot debt market shaped their capital structures in the long run.

The present thesis as a whole contributes to the literature and then is certainly of interest to financial researchers in several aspects. *First*, it comprehensively

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[14] Among others, evidence of debt maturity is shown in Guedes and Opler (1996), Barclay and Smith (1995), Stohs and Mauer (1996), Baker et al. (2003), and of debt yield in Faulkender (2006).

explores the various aspects of market timing involved in corporate debt issue decisions, including maturity, yield and volume. Firms attempt to reduce the costs of debt capital by coordinating all these aspects of debt issuance with the market variations. It extends and integrates previous scattered empirical evidence regarding debt market timing in the literature and shows that market timing is a prevalent managerial behaviour and a fundamental strategy, rather than an occasional phenomenon in corporate financing policies. *Second*, after a certain period of time when the hypothesis of efficient market and rational investors and managers dominates financial studies, behavioural finance opens a door toward a realistic world with the presence of market imperfections and irrationality. This thesis not only reveals evidence regarding managerial market timing on corporate debt issuance, but also examines the underlying mechanism of market efficiency which has been the subject of much debate in recent literature[15]. The plausible evidence regarding the ability of firm managers to successfully time the debt market is due to the mixed definition of market timing. The clarification of the definition bridges the two sides of the argument, and reveals the implications underlying the empirical evidence of debt market timing. The misguided notion of managers' arguable superior information and their actual passive responses to market conditions explain the reasonable existence of timing activities from the standpoint of market efficiency as well as raising the questions of behavioural motivations for further research. *Third*, the growing field of market timing theory will inevitably trigger a stream of research regarding the effects and consequences of market timing on the financial characteristics of firms. The present thesis is arguably one of the earliest studies in this field. It contributes by incorporating market timing into the traditional capital structure theories. There is no universal theory of capital structure, while the market timing hypothesis offers another explanation of the formation and evolution of capital structure due to its long-term influence on the financing policies of firms as revealed in the present study. In this regard, this thesis is in the forefront of behavioural corporate finance and will, as a

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[15] See footnote 2 and the literature review in Chapter 3 for details.

result, stimulate further investigations on the effects of managerial market timing on other corporate financial activities and firm characteristics.

In addition to financial researchers, the revelations of the present thesis should draw the attention of both firm managers and investors. On the one hand, since the ability of managers to detect and generate market imperfections when timing the market affects firm values, investors are supposed to judge the underlying motivations of managers' financial decisions comprehensively and how firms' hedging or timing policies directionally bet. Therefore, the thesis suggests that an understanding of managerial market timing can help investors to better estimate the real financial status behind the financing policies of firms, and then make their own investment decisions. On the other hand, managers are supposed to consider the hedging function of debt financing in their corporate risk management strategies as suggested by immunization theory, although this has been ignored in practical applications. Moreover, based on the conclusions of this thesis, managers should examine to what extent debt market timing reduces the overall cost of capital, and whether there is the possibility of bounded rationality and overconfidence in timing the debt market.

In addition to practitioners of financial markets, the findings of the thesis should also be of concern to economic policy makers or market regulators. An essential conclusion of this thesis is that corporate financing decisions are heavily determined by the judgment of managers on capital market conditions (debt market in this thesis). Moreover, the variations in debt market conditions rest with fluctuations of interest rates, while the adjustments of basic interest rates in turn rely on the judgment of financial market regulators on the situation of the economy. Therefore, with a correct anticipation on the potential reactions of firm managers to the fluctuation in debt market, policy makers should treat the impact of collective behavioural distortions of managerial market timing on the capital markets as an influential factor and then convey the accurate information of market condition

variations when making their macroeconomic decisions regarding interest rate adjustment to avoid the market-wide misallocation of capital. On the other hand, in the case of the presence of capital market misevaluation, the regulators can take advantage of managerial market timing as an instrument to adjust the misallocation of capital. Overall, a profound understanding on managerial market timing as revealed in the present thesis helps the market regulators to better maintain the financial markets on the right track.

All in all, the thesis suggests that market timing should draw more attention and be critically considered by looking at the various issues of corporate finance from comprehensive angles.

Chapter 2: Corporate Debt Issues and Interest Rate Risk Management: Hedging or Market Timing?

2.1. Introduction

2.1.1. Rethinking financial risk management

Standard corporate risk management theory emphasizes the role of derivatives in reducing financial risk exposure. The majority of the existing literature regarding corporate interest rate risk management examines how firms use financial derivative instruments to manage their interest rate exposure, an implicit assumption of which is that firms that do not use derivatives are not hedging. It is supposed that firms are changing or managing their risk exposure simply by using various financial derivatives. However, evidence shows that in practice compared to the magnitude of the overall assets of firms, the magnitude of derivatives usage appears to be small (e.g. Brown (2001), Guay and Kothari (2003)), and firms with more volatile cash flows such as small firms make far less use of derivatives than otherwise more stable (large) firms (Stulz (1996)). This evidence contradicts the "variance-minimization" notion of the modern risk management theory and indicates that the impact of derivatives usage on risk management is limited. Thus, the question that emerges is why do firms not fully hedge their risk exposure by using derivatives, or do they use means other than derivatives to manage risks?

Another implicit assumption of most of the studies that have examined the value creation of risk management is that firms manage risk exposure primarily for the purpose of hedging. However, recent studies have revealed that most firms do not systematically hedge their risk exposure. Rather, the extent to that firms hedge their risk exposure depends on their market views of expected relevant volatilities (Bodnar et al. (1998)). Most firms attempt to hedge risks with the view that they can correctly predict the future movement of the market. They adopt

"profit-oriented and forecast-based" (Glaum (2001)) hedging strategies or, put differently, they time the market. Again, this notion induces the rethinking of corporate risk management.

2.1.2. Corporate debt issuance in risk management

In theory, firms could manage their risk exposure by means other than sole derivative usage, especially when the conditions for derivatives usage are limited. Although financial derivatives are popularly used as the prominent instruments of risk management, it should be noted that derivative financial instruments whose values depend on those of more basic underlying assets are only accessory instruments for revising risk exposure. As derivative financial instruments become increasingly prevalent, the risk management functions of basic financial instruments like stocks or debt seems to be ignored.

Firms issue public debt primarily for the purpose of raising investment funds. However, the values of the debt depend heavily on interest rate variations. Newly issued corporate debt will significantly affect the capital structures and costs of firms. Moreover, their corporate debt issues will essentially influence their overall interest rate exposure. Most existing studies have examined how firms use contracts of financial derivatives accompanied by debt issues to hedge interest rate exposure. However, evidence shows that, the magnitude of derivatives usage is far from enough to hedge the overall risk exposure, compared to the firms' overall assets (Brown (2001), Guay and Kothari (2003)). Although there are various explanations for this phenomenon, an important point that should not be ignored is that corporate bonds *per se* can be employed as instruments of interest rate risk management (Grinblatt and Titman (2002), Stulz (2003)). Therefore, debt issues should involve considerations of interest rate risk management.

In principle, "nonfinancial institutions should be able to immunize firm value against changes in interest rates to some degree by matching the interest rate

sensitivity of their assets and liabilities through active interest rate risk management (analogous to duration matching for financial intermediaries)…" (Bartram (2002) p.107). The value of a firm's assets, V_A, is the sum of its equities, V_S, plus its debt, V_D, (i.e. $V_A = V_S + V_D$). A firm's overall interest rate risk exposure is tightly linked to the interest rate sensitivities of its equities and debt. If, at time $t = 0$, a firm measures the risk exposure of its equity as having a positive interest rate sensitivity (for example, share prices go up when interest rates rise[16], i.e. $\frac{\partial V_S}{\partial r} > 0$), issuing a bond with a negative interest rate sensitivity, i.e. $\frac{\partial V_D}{\partial r} < 0$, will reduce the interest rate exposure of the firm's overall assets. By deliberately adjusting the interest rate sensitivities of their equities and debt firms can hedge their interest rate exposures. One of the most important tools for measuring the interest rate sensitivity of a bond value is the "price value of a basis point (PVBP)"[17], which can be explained as how much a debt's price will increase in response to a one basis point decline in a debt's yield to maturity. Another tool for controlling the interest rate exposure of debt that is closely linked to the PVBP is *Duration*, which is defined as a weighted average of the waiting times for receiving future cash flows. Since smoothing cash flows is one of the most important purposes of risk management, the duration of the debt which is dependent on its maturity and yield type can be employed as a crucial measurement of controlling the overall interest rate exposure of firms when issuing debt. Thus, with the measurements of PVBP and durations, firms can choose suitable yield types and maturity of debt, which determine the interest rate exposure, for the purposes of interest rate risk management. Once managers have measured the interest rate exposure of the firm or investment project, they can reduce the interest rate risk exposure by issuing a debt with suitable yield types and maturities, the value of which moves in an opposite direction from the value of the firm or project as the

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[16] Under certain conditions share prices go up when interest rates rise. For example, increase in interest rate may change the depreciation of a firm's tangible assets in the sense of accounting. Some other cases firms' product prices may increase with the rate of interest.

[17] The price value of a basis point (PVBP) is often referred to as the "dollar value of a basis point decrease" or "DV01".

interest rate varies. Then there is no need to enter into accompanying derivative contracts. From the risk management point of view, the basic underlying financial instruments should attract more attention than derivative financial instruments.

2.1.3. Motivations of corporate debt issue decisions

The basic issue of this chapter is concerned with what motivates firms' choices in debt issuance. If corporate debt *per se* is the effective instrument of interest rate risk management, the question arises as to whether firms virtually make full use of debt issues for hedging purposes, or more specifically, whether firms attempt to design a reasonable yield and maturity structure[18] for the newly issued debt with a target interest rate sensitivity to match its initial risk exposure? Much of the literature has attempted to empirically disclose the sources of value creation from risk hedging through comparisons of the cross-sectional variations[19]. Most of the conclusions regarding value creation are based on the implicit assumption that firms manage risks primarily for hedging purposes. However, recent survey studies (e.g. Graham and Harvey (2001)) and empirical evidence (e.g. Baker et al. (2003)) show that firms' financing decisions including debt issuance are determined by managers' intention to time the market to reduce the costs of capital. Therefore, from the perspective of interest rate risk management, this chapter examines the latent motivations behind corporate debt issues. Specifically, it explores whether firms consider the purposes of hedging interest rate exposure or timing the market to lower their capital costs, or both.

If firms are hedging, the choices regarding the interest rate exposure of their debt should be driven primarily by the interest rate sensitivity of the firms' values or expected cash flows. Provided that the firm's value is sensitive to interest rates, it

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[18] Hart and Moore (1994) suggested that firms tend to match the maturity of their assets and liabilities based on the joint hypothesis of information asymmetry and contracting costs.

[19] Among others, Dolde (1995), Tofano (1996), Geczy et al. (1997), Graham and Roger (2002) indicate hedging adds firm value due to financial distress costs. Smith and Stulz (1985), Grahm and Smith (1999), Geczy et al. (1997), Fok (1997) analyze the hedging motivation of the conex tax function. Geczy et al. (1997). See Fok (1997) about costly external financing, Ljungqvist (1994), Demarzo and Duffie (1995) and Breenden Viswanathan (1998) about information asymmetry, and Tofano (1996), Roger (2002) about manager interests and the reasons behind hedging risk exposure.

can reduce its overall interest rate exposure by issuing a debt position with a desirable interest rate exposure, which should be designed to be in the opposite direction to the interest rate exposure of the firm's pre-issue assets. With this regard, a comparison of the interest rate exposures prior to and after debt issues will show the hedging effects of possible derivatives contracts accompanying the debt issuances.

If firms believe they can time the market and thereby reduce the costs of capital, the debt issues should be driven by debt market condition factors, such as the short and long-term interest rates, inflation, etc. Accordingly, it makes sense that firms might change their decisions concerning debt issues as these market condition factors vary. Deducing intuitively, for example, firms will have more incentive to issue debt when the expected debt returns are lower than they otherwise would. Also, firms will tend to borrow long-term and fixed debt when debt market conditions suggest the cost of long-term debt is relatively low. Consequently, how economic factors such as inflation and interest rate variability determine the market-level changes in debt issue types identifies whether firms are timing the debt market to lower capital costs or hedging volatilities of interest rates.

In contrast to most studies concerning corporate risk management, this chapter focuses on the relationship between interest rate risk management and the basic financial instruments --- corporate debt issues. The UK market is investigated using the debt issue data of the non-financial public firms. The empirical strategy in this chapter is to investigate the effects of corporate debt issues on the interest rate exposure of firms and the relationship between corporate debt issues and debt market factors, and then to explore whether the firm-specific interest rate exposure or debt market factors determine the decisions of firms regarding debt issues.

2.1.4. Findings and implications

In general, the main findings are as follows. Firstly, notwithstanding the intuitive

judgment that corporate debt issues essentially influence the interest rate exposure of firms, a quantitative analysis was conducted to examine this notion. The results show that a relatively high percentage of firms are subject to sensitive stock prices and to the interest rate volatility. Moreover, the two-sample t-test between the stock interest rate sensitivity prior to and after the debt was issued suggests that the corporate debt issue events significantly changed the interest rate exposure of the firms. The asset interest rate sensitivities increased considerably after the debt was issued, which supports the intuitive judgment. This provides a starting point for further research in terms of corporate debt and interest rate risk management. Secondly, by using the quarterly aggregate data, it was found that the debt issues were significantly correlated to debt market factors such as inflation, real short-term interest rates and term spread. As inflation, real short-term interest rates and term spreads increase, firms have more incentives to issue floating rate and long-term debt. The results imply a close connection between the decisions concerning corporate debt issues and the exogenous market factors. Thirdly, in the investigation of the firm-level debt issue data, which involved both the firm-specific interest rate exposure generated from the stock price interest rate sensitivity and the debt market condition factors, it was found that the yield types and maturities of the corporate debt were significantly driven by the market condition variables, while there was no evidence of any relationship between the firm-specific interest rate exposure and the choices of debt yield types and maturity horizons. Therefore, the hedging motivation is not empirically relevant to UK corporate debt issuance. On the one hand, managers are trying to time the debt market by responding to changes in the macroeconomic environment. These results are consistent with the empirical literature concerning corporate debt issues. On the other hand, it seems that firms do not realize or implement interest rate risk management when issuing debt. Taken together, these results suggest that firms are timing the market when issuing debt in an effort to lower their costs of capital rather than implementing the interest rate risk management mechanism.

This chapter brings forward a new point of view regarding the employment of corporate debt to manage interest rate exposure, which the literature has hitherto ignored, and empirically examines the underlying determinants of corporate debt. The chapter refers to the work of Faulkender (2005) but differs from it in some important ways. The measurement and the definition of interest rate risk factors of the firms were modified and more stylised than the typical facts regarding debt market timing in the UK. Moreover, as well as yield types, this chapter also examines debt maturity, which is one of the most important components of corporate debt structure and risk exposure measurement. Thus, corporate debt and interest rate risk management are documented in an integrated way.

The remainder of this chapter is organized as follows. Section 2.2 reviews the literature on hedging and market timing, which includes the traditional theories of corporate risk management and recent developments as well as previous studies with respect to the determinants of corporate debt issues. Section 2.3 develops an empirical strategy to examine the alternative hypotheses. Section 2.4 provides a description of the data and Section 2.5 presents the empirical results and the main findings. Section 2.6 gives conclusions.

2.2. Theories and literature review

2.2.1. Early risk management theories

Under the neoclassical setting, Modigliani and Miller (1958) showed that, in a frictionless market with the absence of information asymmetries, transaction costs and taxes, the financing policies of firms are irrelevant. By the same logic, this notion implies that shareholders can choose strategies to change the exposure of risky assets regardless of the firm's hedging policies. As a result, firms do not necessarily have any comparative advantage over individual investors. Logue and Oldfield (1977) developed a model to show that in an efficient market hedging of foreign exchange rate risks is unimportant. They argued that if exchange rate fluctuations are uncorrelated with the movements in the general market, the variation of a subsidiary's value reduced by hedging is unsystematic, and therefore can be diversified away by investors anyway. In other words, firms gain nothing in expected value from avoiding exchange rate risks. However, if this theory is correct, why is it that in practice firms implement risk management policies regarding their investments?

Since the middle of the 1980s, a considerable body of literature has discussed corporate hedging activities by focusing on why hedging can make sense and under what conditions corporate hedging activities can increase firms' values (e.g. Stulz (1984), Smith and Stulz (1985), Froot et al. (1993)). Contrary to the perfect market proposition, various explanations of potential rationales for corporate uses of derivatives financial instruments have been presented to identify the market imperfections which make the volatility faced by corporations costly. Therefore, risk management theories argue that hedging policies for volatility reduction can actually increase firms' values. These market imperfections that explain why firms should hedge their risks can be roughly categorized as follows: costs of financial distress, convex tax function, costly external financing, information asymmetry, and managerial risk aversion.

Financial distress costs. The probability of bankruptcy will create costs for the firm, such as direct lawsuit costs. Hedging can avoid the firm's financial distress by reducing the probability of bankruptcy resulting from the failure to repay the debt and thereby lower the present value of the costs of bankruptcy (Smith and Stulz (1985)). Although most firms believe they are far from bankruptcy, they cannot guarantee staying out of financial distress for all time which leads to the probability of substantial indirect losses, for instance, losing excellent employees and stable suppliers. Therefore, as long as the costs of the risk management programme are lower than the present value of financial distress costs or bankruptcy costs, risk management adds value to firms. Most empirical studies have found a positive relationship between firms' hedging and the expected probability of financial distress by employing alternative proxies, such as leverage ratios (e.g. Dolde (1995), Tufano (1996), Howton and Perfect (1998), Spano (2004)), leverage ratio multiplied by market to book ratio (Graham and Rogers (2002)), and Altman's Z-score[20] (Brown et al. (2006)). A number of recent studies have examined the relationship between liquidity risks and hedging levels, and provided evidence for the notion that firms with lower liquidity and higher leverage are more likely to use derivatives (e.g. Geczy et al. (1997), Fok (1997), Korn (2003)).

Convex tax function. Tax plays an important role in most financial decision-making, including hedging. The tax benefits of hedging have been indicated in a number of studies. If taxes are a convex function of earnings, in other words, if progressive taxation is adaptive, firms can benefit from hedging (Smith and Stulz (1985)). The logic is straightforward. If effective marginal tax rates are an increasing function of the pre-tax value of corporations, then the after-tax value of the firms is a concave function of its pre-tax value. As long as hedging reduces the variability of the firm's pre-tax value, the expected tax

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[20] The Z-score suggested by Altman (1968) is defined as: Z=1.2(working capital/total assets)+1.4(retained earning/Total assets)+3.3(EBIT/Total assets)+0.6(market value of equity/Total debt)+1.0(Sales/Total assets). According to Altman, the greater a company's Z-score the lower the probability of it encountering financial distress.

liability is reduced and then the expected after-tax value of the firm is increased. This logic is especially adaptive to profitable firms with volatile earnings and firms that have positive earnings for most of the time but occasionally suffer a loss. The point to be noted is that tax incentives would not be an inducement to firms facing a significant probability of negative earnings and unable to carry forward all their losses to subsequent periods. In a word, hedging increases firms' values because of the asymmetric treatment of taxation. By using simulation methods, Graham and Smith (1999) showed that the average tax savings from a 5% reduction in the volatility of taxable income corresponds to 5.4% of the expected tax liabilities. However, the empirical studies do not give consistent support to the theory of tax incentives. The evidence shows that most firms smooth their income by using financial derivatives and benefit from hedging only to a very limited degree so that the tax benefits are in practice much smaller than they are in theory. Moreover, the studies have found no clear evidence that firms hedge in response to tax convexity (Geczy et al. (1997), Fok (1997), Graham and Rogers (1999, 2002), and Graham and Smith (2000)). Therefore, the tax incentive for corporate hedging is still plausible.

Costly external financing. If a firm's internal cash flows are volatile, this variability may result in either variability in the amount of external funds or variability in the amount of investment. Due to the information asymmetry, external financing is supposed to be more costly than internally generated funds. If the cash flows are not enough to support its investment programmes, the firm may abandon a positive NPV investment opportunity because the shareholders will have the incentive to under-invest if the gains accrue primarily to the debt holders (Myers 1977). Hedging reduces the incentive to under-invest and therefore will add value to the firm by stabilizing the cash flows available to attractive investment opportunities. This rationale implies that firms with more growth opportunities, for which R&D expenditures and book-to-market ratios proxy in most empirical studies, are more likely to use derivatives financial instruments to

hedge cash flows (Geczy et al. (1997), Fok (1997)). Meanwhile, a firm's degree of hedging is relevant to the extent of the high costs of external financing and pronounced information asymmetry between the management and outside investors (Glaum (1999)).

Information asymmetry. Managers are intuitively assumed to have superior knowledge with respect to their firm's potential risks and uncertainties. On the one hand, shareholders have an incentive to obtain precise information regarding the firm when deciding whether to continue or abandon their current investments. On the other hand, the managers have an incentive to obscure the information received by investors to reduce their compensation risks. Ljungqvist (1994) demonstrated that managers with private information about their firm's exposure to risks may use financial derivatives to engage in speculation instead of hedging. Therefore, information asymmetry raises the demand for risk management for the purposes of noise reduction and information transparency. (DeMarzo and Duffie (1995)), the accounting report standards in principal countries recently required firms to publish their derivatives uses and hedging activities (FRS 13 published in September 1998 in the UK and FSAS 119 in August 1997 in the US). Breenden and Viswanathan (1998) developed two models to explain why firms hedge, based on a theory of managerial responses to asymmetric information. The assumption is that if managers are only concerned about their reputations, high ability managers will wish to better exhibit their performance to investors and outside observers by hedging uncontrollable risks. Therefore, hedging improves the information available to investors regarding evaluations of management performance and firms' prospects. In practice, this theory reveals the potential reason why prevailing terms with respect to corporate risk management appear in managers' compensation contracts.

Management interests. Compared to shareholders or outside investors, managers are not fully diversified. Most of their wealth depends on the distribution of the

firms' payoffs. As a result, they may implement risk management programmes induced by their own interests rather than for shareholder value maximization. To eliminate the agency costs, managers are compensated by guarantees of contracts if they fulfil hedging activities that maximize shareholders' value. However, compensation contracts affect managers' incentives to implement risk management programmes in different ways. On the one hand, managerial share ownership provides managers with the incentive to hedge risks, while on the other hand stock options induce them not to hedge risks due to the positive relationship between the value of options and stock price volatility (Smith and Stulz (1985), Tufano (1996)). Meanwhile, the tenure of firms' managers affects the interests of their risk management. Tofano claimed that firms whose CFOs are newer in their jobs seem to manage a larger proportion of their risks. In contrast to other theoretic determinants of risk management, managerial interests, skills and performances seem to be particularly relevant (Tufano, (1996), Rogers (2002)). However, the empirical evidence in support of the managerial argument is weak. Some of the studies found no evidence or have even claimed opposite results (e.g. Geczy et al. (1997), Fok (1997)).

In summary, from the middle of the 1980s, risk management theories have developed by identifying various corporate hedging determinants. However, empirical evidence to support these theories is mixed and questionable. Improvements to the theory are needed to further highlight the potential factors of corporate risk management.

2.2.2. Hedging, speculation and selective hedging

Early works on corporate risk management assumed that firms use derivative financial instruments purely for hedging purposes, and "the benefits of derivatives usage accrue solely from the alleviation of market imperfections" (Adam and Fernando (2006), p.286). Most of the hedging research regarding corporate risk management has examined whether the corporate use of derivatives is based on

the traditional corporate risk management theories. They tested the hypothesis that there is a relationship between financial instrument usage and the potential motivations. The empirical results, however, are mixed. Theories that explain risk management as a means to reduce the costs of financial distress, to eliminate the firm's dependence on external financing, or to reduce expected tax liabilities are not strongly supported (e.g. Howton and Perfect (1998), Graham and Rogers (1999)).[21] Therefore, a more basic question arises: do firms really accept the theories of risk management and comprehensively employ financial instruments to hedge the risks they face in their practical management? As a matter of fact, a firm's use of financial instruments can both hedge existing exposure and create extra risks. In contrast to the traditional risk management theory which derives rules from the objective of variance minimization (Carcano and Foresi (1997); Brenner et al. (2005)), numerous survey studies have shown that not all firms use derivative financial instruments purely for the hedging purpose. This raises a doubt regarding the assumption that firms are risk averse. Two essential facts reveal that the hypothesis of hedging might not hold.

Firstly, while there is good evidence in a number of studies using various testing models showing that it is consistent with the risk management theories, it ignores the point that the corporate derivatives usage appears to be a small component of the overall risk of non-financial firms. If firms expect to minimize volatilities, they should fully hedge the risk exposure faced. Brown (2001) found that the impact of derivative instruments has a limited effect on the firm's cash flow so that traditional theoretical risk management motivations are unlikely to explain derivatives usage. Guay and Kothari (2003) used a large sample to provide more evidence by examining the magnitude of corporate derivatives compared to the magnitude of their overall exposure. They indicated that corporate derivative

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[21] Howton and Perfect (1998) found that even though derivatives use in a non-random sample of large US firms was strongly related to the theoretical usage determinants, derivatives use in a random sample of firms was largely unrelated to these variables. Graham and Rogers (1999) summarized the empirical papers that had studied why firms hedge with derivatives. Evidence of the various determinants of corporate hedging is not clear and consistent. They claim that a considerable number of these studies fail to prove the assumed relationships between derivatives usage and the proxies of the determinants.

usage appears to be only a small part of the overall risk profile of the non-financial firm. Their conclusions are consistent with Brown (2001), that motivations other than hedging, such as internal budgeting, performance evaluation and analyst forecast error concerns, significantly influence the objectives of derivatives programmes. In addition, large companies tend to hedge more than small ones (e.g. Fok (1997)). Compared to large firms, small firms should be affected more by market fluctuations and thereby suffer more from risk exposures. However, larger firms are more inclined to self-insure their exposures due to a stronger confidence in their capability to predict the market. A positive size effect is consistent with the notion that firms do not hedge with derivatives unless the benefits are larger than the fixed costs of establishing a hedging programme (Graham and Rogers (2002)).

Second, if firms are risk averse they should aim to minimize the volatilities. Many companies appear to employ risk management strategies for pursuing goals other than volatility reduction. There exists evidence that risk management implementations in many cases are driven by the motivation of speculation rather than hedging considerations (e.g. Ljungqvist (1994)). The speculation mentioned here does not mean that firms use derivatives for risk premiums. Instead, a considerable number of firms attempt to take a chancy market view when deciding on their hedging policies (e.g. Bodnar et al. (1995, 1996, 1998), Howton and Perfect (1998), Glaum (1999)). Firms seem only to seek to avoid the losses of bad outcomes but reserve the benefits of good outcomes, which involves different hedging strategies based on market predictions. Stulz (1996) referred to this type of speculation as "selective hedging", implying that firms use financial instruments not primarily to minimize volatilities, but to hedge the downside risks instead. This explains why firms do not systematically hedge their risk exposures and tend to hedge only a very limited proportion compared to their overall risk profile; the extent to which they hedge depends on their view of future relevant volatilities. If they believe that the risk exposure may change in a way that will increase their firms' value, they might hedge the exposure at a low level or even

not hedge at all. Otherwise, they might hedge at a relatively high level compared to the exposures. By incorporating the concept of "selective hedging", risk management theory was essentially improved from "variance minimization" to "elimination of costly lower-tail outcomes" and also explains the actual corporate use of (derivative) financial instruments, which in most cases is driven by the management's market views about the potential risks. However, if volatility fluctuates in a predictable way, volatility forecasts are important for risk management, otherwise the market view based on volatility forecasts may be misleading (Christoffersen and Diebold (1997)).

A number of survey studies have provided further evidence in support of Stulz's theory through the direct and original investigations of corporate hedging activities. In a survey of corporate derivatives usage, Dolde (1993) showed that 90% of the firms, which comprised 244 Fortune 500 companies, claimed that they had taken a view on the market direction of interest rates or exchange rates and modified their position to accommodate these views. Moreover, the average size of users of derivatives was greater than non-users. The Wharton survey series (Bodnar et al. (1995, 1996, 1998)) showed that managers of more than 60% of the firms surveyed found it difficult to avoid letting their own market view affect their hedging decisions both on hedge timing and hedge size. On the other side of the Atlantic, Grant and Marshall (1997) revealed that a significant number of UK firms sometimes used derivatives for "yield enhancement". In a similar fashion, Glaum's survey (1999) of German companies showed that, following very heterogeneous risk management practices, the majority of firms adopted "profit-oriented, forecast-based" selective hedging strategies. Meanwhile, he predicted that firms with low leverage, high profitability and large market value are more inclined to use forecasts in their hedging strategies.

Recent empirical works are consistent with the above survey results. By catching the percentage changes of debt with the floating exposure after swapping

incorporation relative to the term spread over time, Faulkender (2005) found that corporate interest rate risk management practices were driven by speculation or "myopia" rather than hedging considerations. He found that, as the yield curve steepens, firms are more likely to have floating rate debt to reduce their short-term interest payment relative to locking in at a higher fixed rate, otherwise firms are inclined to raise funds at a fixed interest rate. Therefore, term spread as a strong determinant of the selected interest rate exposure suggests that managers may be speculating. Adam and Fernando (2006) investigated the cash flows from firms' derivatives transactions and shareholder value and found considerable evidence of selective hedging. They concluded that although hedging increases shareholder value, the cash flow gains from selective hedging are small at best. Brown et al. (2006) showed that the manager's market view has an important impact on corporate hedging policies. Consistent with Adam and Fernando (2006), their findings indicated that firms rarely have an advantage when timing the market to significantly increase firm value.

If "market timing" were indeed prevalent in corporate risk management strategies, risk management theory should be "focused not on variability minimization, but rather on down-side-risk elimination" (Stulz (1996), p.9). As a result, the fundamental aim of corporate risk management can be viewed as the purchase of "out-of-money put options" that eliminate the down side risks while reserving the upside benefits of the volatilities. How to selectively eliminate the probability of a "bad outcome" rather than fully cover exposures becomes the emphasis of hedging strategies. Therefore, a series of new methodologies have been developed to model risk exposures. Harris and Shen (2006) found that, compared to minimum variance hedging, which is sometimes known as pure hedging and ignores the speculative component related to the expected returns of the hedge portfolio, minimum value-at-risk (VaR) hedging offers a significant improvement. Topaloglou et al. (2002) developed a conditional-value-at-risk (CVaR) model for multicurrency asset allocation and claimed that this model attains superior results in terms of

both higher returns and lower volatility. In addition, Beltratti et al. (2004) developed a scenario-based optimisation model of selective hedging strategies, which is a more general and dynamic approach because the hedge ratio may change across assets and over time. Their results indicate that transaction costs play a very important role in the selective hedging strategy.

To hedge or not to hedge? How much is hedging needed? These questions cannot be answered simply by following the traditional theories. As more attention is drawn to the practical implementation of risk management strategies, the latent motivations of firms' risk management that the literature has hitherto ignored need to be further explored.

2.2.3. Corporate debt issues and interest rate risk management

Most of the research regarding risk management has been concerned with derivative financial instruments, which are empirically plausible for the majority of firms for the management of their overall risk exposures. Such research does not take into account that firms which do not use financial derivatives may not face the risk that a derivative contract can remedy, or they may hedge risks by means other than derivatives. More importantly, it ignores the important fact that the values of derivative financial instruments are based on those of more basic financial instruments. From the perspective of risk management, derivative financial instruments are the means of controlling or changing the volatilities of basic underlying financial assets such as stocks, debt or foreign currencies. There are more significant effects of the basic financial instruments to manage risk exposure. Grinblatt and Titman (2002) indicated that a newly issued debt can essentially change a firm's interest rate exposure. When correctly aligned with firm-specific interest rate exposure, corporate debt can be used as an effective instrument of interest rate risk management. Where the interest rate sensitivity is moving against the direction of the firm's value as well as there being a suitable maturity matching the firm's future cash flows, corporate debt acts as the direct

tools of interest rate risk management. In such a case, there is no need for the firm to enter into an adjunctive derivative contract. However, firms seem to fall over themselves to use derivatives rather than debt designs to manage interest rate exposure, whereas the debt market conditions rather than the motivation of hedging determine corporate debt issues. Moreover, few empirical studies have directly examined the relationship between debt issues and interest rate risk management, nor has any underlying theory been developed.

Early empirical studies examined the determinants of corporate debt issues focusing on the relationship between debt *maturity* and firm-specific characteristics. Wessels (1988) found a negative correlation between size and short-term debt with the implication that smaller firms cannot afford the high issue costs of long-term debt. Mitchell (1991) indicated that information determines the maturity of new debt. He also found a negative correlation between debt maturity and leverage (Mitchell (1993). Barclay and Smith (1995) showed that larger firms with lower market-to-book ratios have longer debt maturities, while Guedes and Opler (1996) reported that larger firms with higher growth opportunities are more likely to issue short-term debt. Stohs and Mauer (1996) found a positive relationship between asset maturity and debt maturity. They also found evidence that firms' earning surprises, tax rates and debt ratings all affect debt maturity. These early studies reveal evidence of the correlation between the debt maturity and firm-specific characteristics.

Recent literature has paid more attention to the relationship between debt maturity and debt market condition factors, although the notion that debt maturity is related to debt market conditions can also be found in several early studies. After Bosworth (1971), White (1974) and Taggart (1977) revealed that the market level of corporate debt issues is influenced by interest rates, more debt market factors were included in studies concerning debt maturity. Brick and Ravid (1985) found that a decreasing term structure renders short-term debt optimal. Guedes and Opler

(1996) also indicated that the maturity of debt issues is negatively related to the term structure. Baker et al. (2003) found that debt market conditions such as inflation, real short-term interest rates and term spreads predict excess debt returns. Moreover, at the market level, the long-term share in aggregate total debt issues is negatively related to all these variables. These results, when put together, indicate that firms are trying to time the debt market in an effort to reduce the costs of capital. This interpretation is supported by the evidence that the ratio of aggregate short to long-term debt is low when there are expected excess long-term debt returns. However, they also indicated that despite suggestive evidence it cannot be determined whether these are reducing the overall cost of capital because of the usual difficulties of testing debt market efficiency. Kaplin and Levy (2001) comprehensively examined corporate security issues, including both stocks and debt, and revealed that the ratio of aggregate short-term to aggregate long-term debt issues is highly correlated to the macroeconomic conditions. Antoniou et al. (2006) examined the determinants of debt maturity in the framework of taxes, contracting costs, signalling, liquidity risks and maturity matching. Their study sheds light on the static long-run relationship between debt maturity and both firm-specific and market-specific factors. Apart from the effects of firm size, market-to-book ratio, asset maturity, earning volatility, tax rates and liquidity, their results also revealed that the impacts on debt maturity decisions of market-specific factors, such as market equity premium, term structure, share price performance and interest rate volatility, are relevant in the UK.

Although it is widely accepted that there is a negative correlation between expected debt returns and corporate debt issues, which suggests that firms are timing the debt markets, most of the studies have focused only on debt *maturity* and debt market conditions, ignoring the interest rate yield types of corporate debt issues. A public debt issue must involve the consideration of yield type choice apart from maturity. The yield types of corporate debt are related but not always consistent with maturity. A firm faces various options in terms of debt yield

choices which are applied to the interest rate risk management. While various derivatives contracts are employed as accessorial instruments for adjusting the initial interest rate exposure, yield type choices are still important considerations when making decisions regarding debt issues. The yield type choices between fixed and floating rates are closely but not solely linked to the firm's interest rate exposure. Moreover, the latent determinants of a firm's decisions regarding debt yield type choices reflect the attitudes and behaviour patterns of the interest rate risk management. However, few papers, with the exception of Faulkender (2005), have investigated the issue of interest rate risk management in debt analysis. He filled this gap by examining the relationship between the interest rate exposure choices of corporate debt issues and interest rate risk management. In contrast to other studies, he investigated whether the selected interest rate exposure is influenced by the market conditions or the firm's cash flow interest rate exposure. He argued that if the objective of interest rate management is to hedge, then firms that have cash flows that are positively correlated with the interest rate should prefer floating interest payments, whereas firms with cash flows that are either uncorrelated or negatively correlated with the interest rate will prefer fixed interest payments. Alternatively, if a firm's chosen interest rate exposure is not correlated to the cash flow interest rate sensitivities, it may be determined by an alternative objective other than hedging when issuing new debt. Specifically, they may time the market in an effort to reduce the cost of capital. Simultaneously involving two categories of explanatory variables, both the firm-specific risk exposure and the debt market condition variables, Faulkender (2005) examined which behaviour the firms were engaging in. However, his study does not cover the issue of debt maturity. Moreover, his sample set was restricted to one typical industry only and is therefore limited in supporting a convincing conclusion.

2.2.4. Summary

Since the 1980s risk management has become an increasingly prevalent topic of

corporate finance. The literature regarding risk management goes beyond the early theories, which dominates the majority of risk management research with attempts to disclose market imperfections and the effects on firms' hedging activities. Considerations of the subjective behavioural elements in risk management practices has shed light on risk management implementation as influenced by managers' views of future market movements. In this sense, there exists room for improvement to risk management in theory as well as practice.

This chapter examines the determinants of corporate debt issues within the framework of interest rate risk management and contributes to the literature in several ways. Firstly, few prior studies on interest rate risk management have explicitly investigated the effects of the basic financial instruments, specifically corporate debt. This is important because the yields of corporate debt are closely connected to interest rate variability. Any newly issued corporate debt essentially changes the firm's capital structure and future cash flows, and thereby changes the firm's interest rate exposure. As regards the management of interest rate risk, corporate debt *per se* is more important and more direct instruments than accompanying financial derivatives contracts. Therefore, research regarding debt should include the crucial component of interest rate risk management theory. This chapter bridges this gap by connecting corporate debt issues to interest rate risk management analysis.

Secondly, there is copious literature on firms' debt where the focus is the structure of debt maturity. This chapter also examines firms' choices of interest rate yield types, which few studies have explored. This is meaningful because if a firm's interest rate exposure is significantly different from zero, it can be offset by a floating rate debt. Conversely, a fixed rate debt would be the optimal choice where the firm has no significant interest rate exposure. The likelihood of choosing fixed versus floating rate debt can therefore be predicted by estimating the firm's interest rate exposure, from both the firm and market level.

Finally, this chapter explores the latent motivations behind corporate debt issues, because hedging may not be the firm's primary objective. There is some doubt regarding the validity of the hypothesis that firms are risk averse, and so an attempt is made to show that there is a dominant objective. Put differently, the question as to whether managers take advantage of new debt issues in order to hedge interest rate exposure or whether they are used for non-hedging purposes is tested. This chapter aims to examine the interest rate exposure of the firms and the market condition factors, controlling for firm-specific factors such as firm size, and development opportunity.

2.3. Empirical strategy and methodology

2.3.1. Hypotheses

Firms issue debt primarily to raise capital, while the details of any debt issue scheme will involve comprehensive considerations. For instance, the firm needs to decide the reasonable principal value of the newly issued debt to avoid either under-investment caused by insufficient funds or unnecessary capital costs due to over-financing. Meanwhile, the firm should take into account the timing of the issue in order to match the investment project with the market environment. Moreover, choices of debt maturity and yield type essentially influence the firm's future cash flows and interest rate exposure. All these factors are determined by the underlying motivations accompanying the debt issues. With the aim of bridging the gap in the literature regarding corporate debt issues and interest rate risk management, as discussed above, this chapter examines whether firms take advantage of newly issued debt for interest rate risk management or are simply timing the market in an effort to reduce the costs of capital, as well as determining the maturities and yield types of newly issued corporate debt. Guided by these objectives, this study sets forth two hypotheses:

H1: *The purpose of firms' debt issues involves considerations of hedging interest rate risk exposure.*

H2: *Firms' debt issues are driven by debt market conditions in an effort to lower the costs of capital.*

The first hypothesis implies that the characteristics of debt issues are driven by the extent of the firm's interest rate exposure with the intention of lowering the impacts of interest rate volatilities on the firm's expected cash flows and values. In other words, the firm is hedging based on its specific interest rate exposure. However, the second hypothesis suggests that the firm's objective is to time the debt market in an effort to increase shareholder value by incorporating its market

views into the financing policy decisions. Put differently, the firm is speculating for risk premium. These two hypotheses may not be alternatives in the practical sense. It is possible that the expected market movements can be of benefit by reducing the firm's initial interest rate exposure. In such a case, the interest rate exposures of newly issued debt may be consistent with both hypotheses. Therefore, the hypotheses tests will need to involve both univariate and multivariate tests to discover the dominant incentive behind the debt issues.

In this chapter, three stages have been executed to test the hypotheses. Firstly, the firms' interest rate exposure prior to new debt issues was measured. The initial interest rate exposure determines whether firms are supposed to adopt specific strategies to hedge the current risk exposure, and how they should accommodate the new debt with the existing interest rate exposure and the additional exposure caused by the newly issued debt. The after-event interest rate exposure was measured to see whether the debt issues significantly altered the firms' initial interest rate exposure as well as whether or not the firms intended to hedge their risk exposure when issuing the debt. Secondly, the question as to whether there is a significant relationship between corporate debt issues and debt market condition factors was explored using the market-level aggregate debt issues. If this is the case, it provides evidence corresponding to the second hypothesis that firms are timing the debt market. Finally, the above two stages were jointed measured by including both the firm-specific interest rate exposure and debt market condition factors to examine the determinants of the corporate debt issues. This final stage should shed some light on the research question, i.e. do firms hedge or time the market?

2.3.2. Impacts of debt issues on firms' interest rate exposure

Firms face interest rate risks if the variability of the interest rates leads to volatile cash flows or firm values. The interest rate risk comes from two sources: the assets interest rate sensitivity and the debt interest rate sensitivity. In the case where the

cash flows of the assets are sensitive to the interest rates, with the intention of hedging interest rate exposure, the firm should make the cash flows of the debt sensitive to the interest rates as well, the sign of which is on the opposite to the sign of assets. Thus, the firm's interest rate exposure will be fully hedged or, to some extent, reduced. Every new debt issue produces an opportunity for the firm to adjust their interest rate exposure. As new debt will change the capital structure, capital costs and cash flows, and therefore the interest rate exposure, firms should include them in their considerations as regards interest rate risk management. If the objective of the interest rate management policy is to hedge, the firm with assets sensitive to interest rates should measure the risk exposure of its equity and acquire a debt position with an opposite risk exposure to reduce the interest rate exposure of the former. In the case where the cash flows or assets are not correlated with the interest rates, the firm will expect the new debt to be insensitive to interest rates. Following this logic, a measurement was taken of the firms' asset interest rate exposure before the debt was issued to determine which strategy was likely to be adopted and then the incremental interest rate exposure resulting from the newly issued debt was examined by investigating the firms' asset interest rate exposures after the debt was issued. Since firms choose the exposure at the time of the debt issuances, investigating whether they significantly reduced reflects the firms' hedging strategies. In many cases, firms enter into derivatives contracts contemporaneously with the accompanying newly issued debt in order to manage the interest rate exposure. A direct comparison between the interest rate exposure before and after the debt issues comprises the information of possible derivative contracts, which reveals whether or not firms adopt hedging strategies to manage their interest rate exposure and the additional exposure resulting from the new debt.

First we need to define the interest rate risk, and there is a wealth of literature on this issue. The key question is: what and how many risk factors are needed in measuring the exposure to interest rate risk? First of all, the simplest method

introduces one factor only, the yield to maturity, with the assumption that the yield curve moves in a parallel way. However, an accurate measure needs to consider other possible factors as well, and the complication of modelling has impeded studies in this field. Therefore, various methods were produced in trade-off between parsimony and accuracy. Brennan and Schwartz (1979)[22] used one short-term and one long-term rate to measuring the firms' asset interest rate risk exposure[23]. Meanwhile, the market returns were involved to control the systematic risks and therefore for the purpose of firm-specific interest rate exposure measurement.

In terms of dependent variables, Faulkender (2005) employed 20 quarterly cash flows covering five fiscal years prior to the debt issues to measure the firms' interest rate exposure. This measurement introduces several potential problems. First, it could be argued that a five-year period is too long as the financial characteristics of the firms may change markedly. It is difficult to exclude the influence of confounding events on firm's interest rate exposure. On the other hand 20 observations can be said to be too small to accurately measure firms' interest rate exposure. Second, measuring cash flows could be problematic since firms usually decorate their financial statements by smoothing out their cash flows (Kaplin and Levy, (2001)). Third, due to the discontinuous nature of cash flows (cash flows are reported only periodically) they cannot be accurate measures of firms' interest rate sensitivity as cash flows ignore the interest rate volatility during the period between the two reported dates. Finally, under efficient market hypothesis, if cash flows are sensitive to the interest rates, the information they contain is reflected in the stock prices. On the one hand, stock prices are instantly observable reflecting investors' expectations on firm values and hence they do not suffer from the limitations of cash-flow. Hence stock prices are better proxies to represent managers' financial decisions corresponding to the changes in capital market environment. Specifically in this model, the firms' stock returns for the 50 weeks prior to the debt issues were used to estimate the initial interest rate

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[22] They developed an arbitrage model of the term structure of interest rates based on the assumption that the whole term structure at any point in time may be expressed as a function of the yields on the longest and shortest maturity default free instruments.

[23] In Faulkender (2005), 6-month LIBOR is chosen as the only benchmark interest rate because most commercial debt is primarily tied to LIBOR if it is floating. Moreover, the variability of LIBOR rates plays the role as the indicator of interest rate movements.

exposure, which was measured by the asset sensitivity to changes in both the short and long-term interest rates. The following regression was run to examine the interest rate exposure based on the stock prices.

$$R_{i,t} = \alpha + \gamma R_{m,t} + \beta_{s,i} I_{s,t} + \beta_{l,i} I_{l,t} + \varepsilon_{i,t} \qquad (2.1)$$

where $R_{i,t}$ is the weekly stock return of the ith stock at the week t. $R_{m,t}$ is the FTSE-all index returns as the proxy for the market return. The weekly changes of the three-month Treasury bill rates, $I_{s,t}$, and ten-year Treasury bond rates, $I_{l,t}$, proxy the short and long-term interest rate exposure, respectively. $\beta_{s,i}$ and $\beta_{l,i}$ measure the ith firm's operation exposures to the short and long-term interest rates prior to and after the debt issues[24]. The comparisons of β_s or β_l prior to and after each debt issue show the influences of the new debt issues on the firm's interest rate exposure. If during the 50-week event window there was more than one debt issue event, they were consolidated into a sole event to avoid overlapping, and the measuring period was extended to the week before the earliest event. In order to measure the effects of the debt issues on the firms' initial interest rate exposure and to identify the underlying intention accompanying them, the interest rate exposure after the debt was issued was tested using the same method as that used for the period prior to the events.

When looking at the situation prior to a debt issue event, four instances may appear in the results which imply the different behaviours the firms were engaging in. Firstly, if the stock prices were sensitive to the interest rate before the debt issue but became insensitive after the debt issue, the event has influenced the firm's interest rate exposure significantly. This may result from either a designed hedging purpose or unintended outcomes accompanying the debt issue. The result caused by each potential reason exhibits the favourable influence of the debt issue on hedging the firm's interest rate exposure. Secondly, if conversely, the stock

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[24] The model is actually CAPM-based with the applications of the efficient market hypothesis and information communication process. The explanatory variables are examined contemporarily. One-lagged explanatory variables are also examined but with consistent results in both features of individual β and the overall distribution of the whole sample, therefore not reported.

prices were insensitive to the interest rate before the debt issue but became sensitive after the debt issue, the newly issued debt clearly creates the additional interest rate exposure but the firm has failed to eliminate its influences. Thirdly, if the interest rate sensitivity of the stock prices is insignificant before the debt issue and remains unchanged after the event, the new debt may have had a negligible effect on the firm's interest rate exposure, which implies that the interest rate exposure created by the new debt has been hedged. Finally, the most complex instance arises where the sensitive interest rate exposure of the pre-debt-issue stock prices remains significant after the debt issue. Depending on the extent of the β changes, a decrease of β implies that the new debt has offset part of the initial interest rate exposure, while an increase of β may result from additional interest rate exposure created by the new debt. In short, by examining the influence of the new debt on the firm's initial interest rate exposure, it is possible to reveal whether the corporate debt was used as instruments for hedging instruments interest rates.

2.3.3. Market-wide choices of corporate debt issues and debt market conditions

After examining the influences of the debt issues on the interest rate exposure of the firms, a further exploration was made into whether corporate debt issues are related to market conditions. In contrast to examinations of individual observations to discover the impacts of debt issue events, here the potential exogenous influences from the market-wide view were documented. It would seem intuitively that decisions regarding debt issues are inevitably influenced by exogenous factors, and indeed this has been indicated by a number of previous studies (e.g. Guedes and Opler (1996), Kaplin and Levy (2001), and Baker et al. (2003)). These exogenous debt market factors involve various measures of interest rates, inflation rates, term spreads and expected excess debt returns. For example, interest rates and inflation rates, which play the role of indicators regarding economic growth, induce firms' debt issuances and financing policies. It also makes sense that an increase in interest rates may induce firms to issue short rather than long-term debt

to reduce capital costs. Additionally, when the yield spread curve steepens, firms tend to borrow at floating and short-term debt rates (Faulkender (2005)). Although many studies have explored debt issue choices in a cross-section, Baker et al. (2003) examined the variations in the maturity of new debt issues as connected to the debt market conditions by employing the aggregate debt issue data. Their study showed that the levels of long-term debt as part of the total debt issue during given time periods were determined by inflation, the real short-term rates and term spread, while other variables such as the credit spread and credit term spread were not significant. Meanwhile, they claimed that the expected variation in excess debt returns predicts the levels of the long-term debt, which suggests that firms are timing the debt market. In line with Baker et al. (2003), the aggregate debt issues data was used in this chapter to determine the general tendency of the debt issues regarding both debt maturity and yield type choice to correspond to the movements of the debt market conditions. Although this fully aggregated data might "hide any cross-sectional differences in behaviour that might be due to variation in firm characteristics" (Baker et al. (2003), p270), this possibility is explored in the subsequent section which analyses the cross-sectional data with the controls of firm-specific characteristics.

According to the results of Baker et al. (2003) and Faulkender (2005)[25], debt market conditions are represented by three variables: inflation, realized real short-term interest rates and term spread. Although it could be argued that other market factors may also represent the characteristics of the debt market, it is believed here that the above three variables represent the principal tendency of the debt market and the purpose of this work is to identify the relationship between corporate debt issues and the debt market qualitatively rather than accurately predict firms' debt issues. In addition, as long as a pronounced relationship is

[25] Faulkender (2005) concluded that term structure determines firms' interest rate exposure choices although he also included credit spread in the models. Baker et al. (2003) involved seven variables concerning the debt market conditions which also included the expected inflation, the credit spread and the credit term spread, but only inflation, the realized real short-term interest rate and the term structure are significantly correlated to the debt issue choices.

found between the debt issues and debt market under the current assumptions, whether or not all possible market variables are involved is not crucial for the conclusion. Only if the assumptions are not proved would it be necessary to consider whether any other important factors have been ignored. Therefore, whether there is a need to further examine the debt market structure depends on the test results.

With this objective, the market-wide debt issuing tendencies of different types of debt categorized by yield types were examined as well as by length of maturity. The debt issues were sorted by interest rate exposure choice, specifically, the floating rate and the fixed rate debt. Meanwhile, all the observations were categorized by the lengths of maturity. This raises an issue concerning the definitions of long and short-term debt. Usually a debt with a maturity of longer than a year is regarded as a long-term debt from the accounting point of view. However, since the majority of public debt is longer than a year, the definitions of long and short-term debt vary across different studies. For example, in an early study conducted by Modigliani (1966) all public debt was sorted into several categories. Debt with a maturity of no longer than two years was regarded as short-term, while those with a maturity of longer than 12 years were long-term debts. The rest was intermediate debt. The methods employed in various other studies include a maturity of three years which divides the long and short-term debt (Barclay and Smith (1995)), and three years and seven years to divide the long, medium and short-term debt (Kaplin and Levy (2001)). Following the Federal Reserve, Baker et al. (2003) categorized the long-term debt by types as the sum of "industrial revenue debts", "corporate debts" and "mortgages", which is specifically employed in the US debt market. Therefore, how to divide long and short-term debt by maturity is a subjective choice. The standard usage was employed here to define debt with a maturity of less than five years as short-term debt, and more than ten years as long-term debt. The rest are medium-term debt. To test the robustness of this definition, an alternative measure was employed to

check its validity. The following regression (2.2) was run to examine the determinants of the market-wide debt issues and to reveal whether or not there was a relationship between the debt issues and the market conditions. This involved the debt market factors including inflation (INF_t), the real short-term interest rate (the difference between the inflation rate, INF_t and the 3-month Treasury bill rate, G_{St},)[26] and the term spread (the difference between the 10-year Treasury bond rate, G_{Lt}, and the 3-month Treasury bill rate, G_{St}).

$$D_t = a + b_1 INF_t + b_2 (G_{st} - INF_t) + b_3 (G_{Lt} - G_{St}) + \varepsilon_t \qquad (2.2)$$

Where D_t denotes the aggregate percentages of the deal numbers of floating rate debt, fixed rate debt and the long, medium and short-term debt for each quarter respectively. Therefore, the dependent variable was standardized by generating the levels of all types of debt over the total debt issues to eliminate the measurement error which may exist in the changes in the deal numbers[27]. Under the market timing hypothesis, when firms expect the interest rates to decline during the period of the debt's maturity, they will prefer floating rate debt to fixed rate debt (Faulkender (2005)). Moreover, if the long-term interest rate is higher than that expected by the firms, there is a greater incentive to issue short rather than long-term debt, and *vice versa* (Baker et al. (2003)). Therefore, apart from investigating the contemporary relationship between all types of debt issues and the market factors, the extent to which the differences between the various types of debt were affected by the market condition factors was also examined to reveal the underlying behaviour and preferences behind the choices of debt issues. Since this fully aggregated data might "hide any cross-sectional differences in behaviour that might be due to variation in firm characteristics" (Baker et al. (2003), p.270), this

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[26] Following Baker et al. (2003), I implement the Kalman filter procedure of Fama and Gibbons (1982), decomposing the Treasury bill rate into inflation and the real short-term interest rate. There are two concerns with this analysis. On the one hand, the decomposition depends on a structural assumption about the process of the real interest rate. The real rates are better able to reflect the market interest rates and the variations of corporate debt issuance desires than nominal rates. On the other hand, inflation rates are employed separately as a proxy of economy conditions to reveal the influences of the overall economy on corporate debt issuance, in contrast to the real interest rates in debt markets.

[27] As suggested by Baker et al. (2003), if the numbers of different debts issued are volatile, the levels of various types of debts over the total debt issues more accurately measure the preferences than the changes.

possibility is explored in the subsequent section which analyses the pooled data of the individual debt issue events by controlling the firm-specific characteristics.

It is unsure whether the underlying relationship between debt issues and debt market factors is contemporary or whether there is a lead-lag, because managers usually make predictions regarding market movements before making decisions[28]. There are no clues re garding the procedures followed by firms when making market predictions, but they are more likely to make judgements about the debt market tendency based on the current available information where there are three or six months before the issuing date. Therefore, a more convincing way to investigate this is to involve the lagged debt market variables in the regressions, if managers do make decisions based on the current available information. In addition, a more direct method to test whether all available information at the time of making a debt issue decision is embodied in that decision is by examining the lagged independent variables, because if firms do time the market when issuing debt, the aggregate debt issues during the previous period must comprise all information available at that moment. This is analogous to investment analysts making technical analyses based on the current stock prices and the past tendency of price movements. Firms may refer to the opinions of other firms concerning their views of the debt market which are embodied in the aggregate debt issues at that moment. Another advantage in doing this test is that it is more robust to include the influences of other explanatory factors regarding the debt market conditions excluded from the regressions. This allows entry in an unrestricted way and explains at least as much about the variations in each type of debt issue as the above three debt market variables do. Moreover, if there is a significant issuing tendency for the various types of debt across time periods, that is to say, debt issues are auto-correlated in a time series, this will provide strong evidence that firms make debt issue decisions according to their view of the market, i.e. they are timing the market.

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[28] Baker et al. (2003) indicated that the relationship between the corporate debt issues and the market conditions is found to be contemporary.

The auto-regression models (2.3) were built as follows. Sorted by yield types and the lengths of maturity, the dependent variable, d_t, is replaced by the time series of quarterly deal numbers or deal values of floating rate debt, fixed rate debt, short-term debt and long-term debt in every test respectively. According to the debt issuing procedure, there is usually a three to six month time-scale (one or two lags for the quarterly data) between producing the debt issue plans and implementing the issues. Therefore, the number of lags, i, takes 1 or 2 respectively. In order to eliminate the influence of economic growth and the preference variations of the debt choices, a time trend, T_t, was introduced into the model.

$$d_t = a + T_t + \sum_{1}^{i} b_i d_{t-i} + \varepsilon_t \qquad (2.3)$$

Apart from the changes of aggregate quarterly deal numbers and deal values across the time periods, the levels of the different types of debt, d_t, over the total issues of the debt market, D_t, were also tested as shown in the auto-regression (2.4). With the same notations as the regression (2.3), the dependent variable, d_t/D_t, is replaced by the percentage of quarterly deal numbers or deal values of floating rate debt, fixed rate debt, short-term debt and long-term debt over total debt issues in every test respectively. The number of lags, i, still takes 1 or 2 respectively. However, because the levels already contained the effects of economic growth, the time trend was not involved in the model.

$$\frac{d_t}{D_t} = a + \sum_{1}^{i} b_i \frac{d_{t-1}}{D_{t-1}} + \varepsilon_t \qquad (2.4)$$

In short, in this sub-section, the issue of whether debt market conditions affect the yield types and maturity of corporate debt issues is examined. Meanwhile, the aim was to make comparisons between the various types of debt to reveal what determines the choices firms make concerning the yield types and maturity of their debt issues. Therefore, a model involving three debt market variables was employed to examine these assumptions. In order to eliminate the effect of not

including the potential debt market factors in the regressions, the lagged independent variables of the debt issues were used to explain the current variations, which identifies the market tendencies of the debt issues and the firms' underlying intentions and behaviour when making decisions.

2.3.4. The determinants of corporate debt issues

After exploring the incremental interest rate exposure generated by the newly issued debt, which identifies the essential effects of the new debt on the firms' initial risk exposure, as well as examining the relationship between the market-wide debt issues and the debt market conditions, the determinants of the corporate debt issues, i.e. whether the firms were primarily concerned with matching the interest rate exposure of their assets to their liabilities or timing the market to lower the costs of capital, were then examined. If the firms were hedging, the debt issues should be driven by the firm-specific interest rate sensitivity. Alternatively, if they were attempting to time the market and lower the costs of capital, the debt issues should be linked to the market condition movements. Following this logic, multivariate tests were carried out involving both the firm-specific interest rate exposure and the debt market variables, to examine both hypotheses synchronously and disclose the dominant motivation. Since the market-wide aggregate data ignores the cross-sectional variations of the firm-specific characteristics, the firm-level data is better able to identify the differences in the preferences of debt financing. Therefore, the pooled firm-level data was used in the regressions rather than the aggregate data. Using the interest rate exposure prior to the new issues, given potential measures of hedging and market pricing, and a number of control variables, probit regressions (2.5) were estimated to detect the determinant factors of the firms' choices of debt yield types and maturity.

$$D_i = a + b_1\beta_{s,i} + b_2\beta_{l,i} + \sum_{j=1}^{3} c_j\gamma_{i,j} + \sum_{t=1}^{2} d_t\varphi_{i,t} + \varepsilon_i \qquad (2.5)$$

A. Explanatory variables.

Consistent with the estimation of firm-specific interest rate exposure, the sample contains 579 debt issues adjusted by the event windows. The independent variables comprise three sets of variables for different objectives respectively. Firstly, asset interest rate sensitivity, $\beta_{s,i}$ and $\beta_{l,i}$ measure the *i*th firm's operation exposures to the short and long-term interest rates prior to the debt issues, which are generated from regression (2.1). If the firms are hedging, the yield type choices and the maturity should be related to the initial interest rate exposure. In the period prior to the debt issues, the hedgers may select the desirable yield type of the new debt according to the firm's interest rate exposure. Specifically, if the interest rate betas are positive, which implies the firm's stock prices will increase as the interest rates rise, and vice versa, the firm will prefer a floating rate debt for the objective of smoothing the firm's value, because the cash flows of the new debt will balance the volatilities resulting from the positive interest rate sensitivity of the stock prices. Alternatively, firms that are either negatively correlated or uncorrelated to the interest rates will prefer a fixed rate debt in order to eliminate the additional risk exposure caused by the new debt. The concern here is with the significance and signs of the coefficient of the betas. Therefore, in addition to the primary measure of interest rate exposure generated from the previous tests, the measure was modified to verify that the results are robust to the specifications of the interest rate exposure. Aside from quoting the estimated interest rate betas directly, the interest rate exposure was specified by the dummy variable which takes values according to the signs of the betas estimated from the model (2.1). The interest rate exposure also affects the debt maturity. Working on the assumption that there is hedging, the firm with a significant risk exposure will have more incentive to issue a short-term debt to weaken the effects of the incremental risk exposure. Otherwise, a long-term debt will be preferred, *ceteris paribus*.

Secondly, the debt market variables used were similar to those employed in the regression (2.2). $\gamma_{i,j}$ denote a series of variables regarding the debt market conditions in the corresponding months when the debt was issued. Inflation, the real short-term interest rate and term spread were introduced as the basic debt market condition factors. These macroeconomic variables were employed to measure the costs of debt at the time when the debt funds were raised. If a firm's likelihood of distress changes over time with changes in the economy, the decision regarding the firm's raising of debt funds may change with the state of the economy. Then, the inflation rate plays the role of economic indicator. If firms are trying to reduce their short-term costs of capital in response to changing market prices, their interest rate exposure should vary with changes in the short-term interest rate. In addition, the term spread reflects the variations between the short and long-term interest rates, which may affect the firms' judgment regarding the long-term tendency of the interest rate variability and, in turn, their preference of debt maturity.

A number of control variables were included to eliminate the effects of firm-specific characteristics on the debt issue preference. $\varphi_{i,t}$ denote the control variables of firm size and market-to-book ratios corresponding to the time when the debt funds were issued. According to the literature regarding capital structure choices and the determinants of debt issues, the preference of debt issues varies across firms with different financial characteristics. Consistent with Myer (1977), Barclay and Smith (1995) indicated that firms that have few growth options, or are large, have more long-term debt. Baker and Wurgler (2002) found that firms with high market valuations, as measured by the market-to-book ratio, raised fewer debt funds than those with low market valuations. In addition, Guedes and Opler (1996) involved a number of variables regarding the debt issuers' characteristics, and found that firm size and the market-to-book ratio both significantly affected the maturity of firms' debt. Therefore, firm size and the market-to-book ratio were controlled as the proxy for the firms' ability to achieve particular exposures and

growth opportunities, because both variables are widely accepted as important factors affecting firms' debt issues. Moreover, since the main objective is to explore the firms' attitudes toward interest rate risk management, other variables revealed in the literature were ignored and this topic is left to future studies.

B. Explained variables

Although there is a wealth of literature that has focused on debt maturity, few studies of corporate debt issues have considered the interest rate exposure choices from the risk management point of view. In this chapter, the determinants of both the yield types and maturities of the firms' new debt have been examined respectively, notwithstanding targeting the consistent objective.

The probit regression was estimated for the firms' choices of interest rate exposure for the new debt with the explanatory variables. This examined the determinant factors for firms choosing floating or fixed rates for their debt funds. The dependent variable D_i was set as the dummy variable which took the value of one if the yield type of the debt was floating, and zero otherwise, in the regression (2.5). Apart from the yield type choice, the choices regarding debt issues also involve the debt maturity. As with the choice of yield type, decisions regarding debt maturity may be affected by either exogenous or endogenous factors. On the one hand, since the firm's value varies as the different debt maturity changes the future cash flows, the firm with a plan for raising debt funds will consider matching the debt maturity to the time horizon of the investment project, as well as matching the future cash flows of both the debt funds and the investment project to avoid the extra volatility of the cash flows. On the other hand, exogenous factors may induce firms to consider debt issue strategies as other than or more than to hedge risk exposure. If the debt market conditions suggest that the costs of a long-term debt are predictably low, firms will prefer to raise long-term debt funds rather than the short-term debt to lower the costs of capital, even if the short-term debt financing is enough to meet the need of the investment fund. Therefore, it is

necessary to examine debt maturity as the indicator of whether the firms are hedging or timing the market. As the alternative specification of the regression (2.5), D_i takes the value of positive one (+1) if the debt was short-term and negative one (-1) for long-term debt and zero otherwise. Finally, the dummy dependent variable of debt maturity was replaced by the year horizons of debt maturity in the regression (2.5) to directly examine the firms' debt maturity choices and to eliminate the potential bias resulting from the definitions of short and long-term debt.

In short, this regression examines whether it is the firm-specific interest rate exposure or the debt market conditions that determine the firm's interest rate choices for new debt issues, controlling the firm size and the MTB ratio. Finally, after presenting the initial regressions to test whether firms are hedging or timing the market, alternative specifications were used to separate out the different interpretations of the findings. Following these were numerous robustness checks to determine whether the effects found for the entire sample were symmetric or whether the factors that motivated particular exposures differed, based on the source of the funds and the relative size of the debt issue. As documented below, the empirical findings are robust to all these alternative specifications.

2.4. Data and descriptive statistics

A sample set was built of the corporate debt issues of non-financial firms in the UK covering the period 1986 - 2004. In this section there is first a description of the selection procedure for the firms in the sample and the information about the debt collected for these firms. This is followed by a definition of the debt market variables and then the data is presented. The data regarding the debt market factors is translated into the aggregate types to accommodate the targets of this chapter.

The basic data employed in this chapter is the corporate public debt issues, which

were quoted in the Securities Data Corporations (SDC) Platinum. The debt types cover all convertible and non-convertible debt, preferred stocks and mortgage/asset backed and private debt. From all the firms with debt issues, the non-financial firms in the UK market during the sample period[29] based on the Standard Industrial Classification (SIC) code were selected. The financial firms with SIC codes from 6000 to 6999 were excluded from the sample. An initial sample of 1,518 debt issues was obtained. However, subject to the estimates of the firms' asset interest rate exposures, which involve the firms' stock prices, only the public firms remained. The information contained in each debt issue observation also includes principal values, issue dates, years to maturity, S&P and Moody debt credit rates, and interest rate yield types. Using these selection criteria, a sample of 742 debt issues from 217 firms, for the period 1986 - 2004, remained. Without a restriction of issue size, the smallest value of observations is 0.62 million US dollars. Table 2.1 presents the annual distribution of the debt issues sorted by maturity and yield types. In general, 67% were fixed rate debt, 23% were short-term rate debt (a maturity of less than five years) and 32% were long-term debt (a maturity of over ten years). As seen from the time series, the variations of the debt deal numbers tended to increase over time. This may have been due to the market-wide trend of debt issues, because the sector growth of the economy will stimulate the expansion of the debt market. Moreover, some specific factors in the debt market may have introduced an incentive for the firms to raise debt funds. This is examined in the empirical work.

Table 2.1 Sample Annual Distributions

Corporate debt issue data was collected from Securities Data Companies Platinum (SDC). The debt types cover all convertible and non-convertible bonds, preferred stocks and mortgage/asset backed and private debt issued by UK non-financial public firms which have codes available on Datastream. A sample group of 742 debt issues from 217 firms, spanning the period from 1986 to 2004, remains. The whole sample is sorted by yield types and maturity horizons. Defined as the standard usage, short-term debt has the maturity of no longer than 5 years, while long-term debt has the maturity of longer than 10 years.

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[29] The SDC provides the data regarding the corporate public debt issues from 1985. However, because the LIBOR data which is used to estimate the firms' initial interest rate exposures is only available from 2nd January1986 in the DataStream International, we started our sample period from 1986.

	Short-term debt	Median-term debt	Long-term debt	Fixed rate debt	Floating rate debt	Annual issues
1986	2	4	2	8	0	8
1987	3	7	2	5	7	12
1988	10	1	8	17	2	19
1989	3	3	5	6	5	11
1990	3	5	6	2	12	14
1991	8	9	11	14	14	28
1992	6	10	6	12	10	22
1993	3	18	9	15	15	30
1994	1	11	11	7	16	23
1995	3	9	9	11	10	21
1996	5	17	9	23	8	31
1997	8	27	20	33	22	55
1998	3	20	21	30	14	44
1999	9	21	27	45	12	57
2000	36	27	18	59	22	81
2001	26	29	22	57	20	77
2002	21	35	17	45	28	73
2003	11	48	26	70	15	85
2004	13	30	8	37	14	51
Sum	174	331	237	496	246	742

It can be seen that two-thirds of the deals were fixed rate debts. This level is, to some extent, lower than expected because previously the majority of the corporate public debt had adopted a fixed yield. This raises the question consistent with the hypothesis as to why firms sometimes prefer to issue floating rate debt. The difference between the short and long-term debt heavily depends on the manual separation. This is checked in the robustness test. Table 2.2 presents the sample statistics using the categories of yield types and lengths of debt maturity.

Table 2.2 Sample Statistics

Panel A displays the maturity statistics of the whole sample and the sub-sample sorted by yield types and maturity. **Panel B** displays the quarterly aggregate debt market factors and corporate debt issues. Inflation is the real quarterly inflation generated from the announced UK consumer price index (CPI). The real short-term rate is estimated as the three-month Treasury bill rates minus actual inflation. The term spread is the difference between the 10-year Treasury bond rates and the three-month Treasury bill rates. (1) to (5) denote the aggregate quarterly deal numbers of the floating rate (D_f), fixed rate (D_F), short-term (D_s), medium-term (D_m) and long-term (D_l) debt; (6) to (10) denote the aggregate percentages of deal numbers of all types of above debt to the total issued debt during each quarter. **Panel C** displays the pooled data employed in the multivariate hypotheses tests. Beta-pre-Glt and Beta-pre-Gst denote the stock price interest rate sensitivity to the short and long-term interest rates before the new debt issues. Other market condition variables are defined as in Panel B but generated at the dates of issuance events instead of aggregate types.

	N	Mean	SD	Median	
Panel A Sample maturity statistics					
Total sample	742				
Maturity (year)		14.5	20.2	10.1	
Fixed rate bonds	496				
Maturity (year)		12.6	12.2	10.1	
Floating rate bonds	246				
Maturity (year)		18.8	30.8	8.1	
Long-term bonds	237				
Maturity (year)		21.69	24.53	11.03	
Medium-term bonds	331				
Maturity (year)		6.93	1.16	7.13	
Short-term bonds	174				
Maturity (year)		2.37	1.27	2.28	
Panel B: Quarterly aggregate data statistics					
Quarterly debt market conditions					**Correlarions**
(1) Inflation (%)	76	3.77	2.20	3.13	(1) (2) [0. 216]
(2) Real short-term rate (%)	76	3.91	1.61	3.77	(2) (3) [-0. 255]
(3) Term Spread (%)	76	0.04	1.78	0.21	(1) (3) [-0. 332]
Quarterly aggregate bond issues					**Difference (t-Value)**
(1) Df	76	3.1	3.1	3	(1)-(2) [-4.357]***
(2) DF	76	6.3	5.8	5	
(3) Ds	76	2.2	2.7	1	(3)-(4) [-3.699]***
(4) Dm	76	4.3	4.1	3	(4)-(5) [1.974]**
(5) Dl	76	3.0	2.5	3	(3)-(5) [-2.294]**
(6) Df/(DF+Df)	76	0.36	0.29	0.33	(6)-(7) [-5.720]***
(7) DF/(DF+Df)	76	0.63	0.30	0.67	
(8) Ds/(Dl+Dm+Ds)	76	0.23	0.41	0.35	(8)-(9) [-3.298]***
(9) Dm/(Dl+Dm+Ds)	76	0.24	0.28	0.25	(9)-(10)[4.372]***
(10)Dl/(Dl+Dm+Ds)	76	0.17	0.43	0.33	(8)-(10)[1.240]
Panel C: Cross-sectional variable statistics					
Beta-pre-Glt	579	0.013	0.758	0.084	
Beta-pre-Gst	579	-0.092	1.782	-0.174	
Inflation (%)	579	2.95	1.58	2.76	
Gst-Inflation (%)	579	3.26	1.39	3.32	
Glt-Gst (%)	579	0.21	1.38	0.32	
MV ($Mil)	579	4504.23	8062.48	2101.61	
MTBV	579	2.47	8.34	2.02	
Maturity (Years)	579	15.07	21.42	10.14	

*,**, and *** correspond to the differences of each pair of variables being significant at 10%, 5%, and 1% respectively, in respect of with the *t*-statistics of based on one-tailed mean comparison tests with unequal variances.

Panel A categorizes the yield types and horizons of debt maturity. On average, the whole sample had a maturity of 14.5 years. The sub-sample of floating rate debt had a higher mean and standard deviation on both the maturity and principal values than the sub-sample of fixed rate debt. Therefore, the floating rate debt was heterogeneous.

According to the proposed empirical strategy regarding the market timing tests, the raw data was translated into aggregate quarterly data. Panel B presents the quarterly aggregate statistics of the debt market condition variables used in this study, including inflation, the real short-term interest rate (the difference between the short-term interest rate and the realized inflation rate), and the term spread (the difference between the long-term interest rate and the short-term interest rate). The inflation rate was estimated from the monthly CPI data from the UK National Statistics. The UK National Statistics provided the monthly CPI data back to 1988 only. Moreover, the measures of the CPI data were not coincident during this period[30]. To avoid losing more sample observations, the estimated inflation rate conducted by Jim O.Donoghue (2005)[31] was adopted. The three-month Treasury bill rates and the ten-year Treasury bond rates were used as proxies for the short and long-term interest rates respectively, both of which were collected from the Thomson Financial Datastream. It can be seen that the signs of the real short-term

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[30] The UK Harmonised Index of Consumer Prices (HICP), from 10 December 2003, is known as the CPI. The HICP was launched in 1997 in response to the need for a Europe-wide comparable measure of inflation (as required by the Maastricht Treaty). The HICP measures inflation, each month, in the European Monetary area as a whole and individually measures and compares each Member State. Eurostat has published this measure as the UK HICP since 1997. However, the UK had not used the HICP as the measure of inflation until the end of 2003.
In the Pre-Budget Report on 10 December 2003, the Chancellor of the Exchequer changed the UK inflation target from one based on the Retail Prices Index (RPI), excluding mortgage interest payments, to one based on the Harmonised Index of Consumer Prices (HICP). Reflecting the new role as the main UK domestic measure of inflation for macroeconomic purposes, the National Statistician decided that the UK HICP would now be known as the Consumer Prices Index in all National Statistics releases and publications. This should not be interpreted as implying that there is any intention to develop the CPI differently from the HICP. The CPI and HICP will remain one and the same index. Since the HICP was only available after 1997, the CPI now used in all national statistics and publications is estimated by using the standard of the HICP structure. However, the UK National Statistics only provides the monthly HICP (CPI) from 1988.
An alternative measure of inflation is the producer price index (PPI), provided by UK National Statistics as well. However, since it only covers the items of goods brought or sold by manufacturers (See details in National statistics report: The guide to producer price index), consumer price index (CPI) will be a better measure of the inflation due to our sample which comprises not only manufacturers but also service providers.
[31] Jim O.Donoghue (2005), Harmonised Index of Consumer Prices: Historical Estimates, Office for National Statistics. He estimated the HICP (CPI) during the early periods from 1975 to 1987 and from 1988 to 1998 respectively due to the availability of raw prices.

rates and the term spread varied over time. The long-term rate was not always higher than the short-term rate during the sample period, which may have induced the firms to decide the debt maturity according to the slope of the yield spread if they were seeking to reduce the costs of capital. The quarterly issues were cumulated. All the pairs of quarterly aggregate data, apart from the short and medium-term debt, were significantly different both as regards the issue numbers and the levels, which indicates that the tendency of the debt issues were correlated to the yield type and maturity.

Panel C presents the sample statistics of the firm-level individual observations rather than the market-level aggregate data. An event window was constructed for each debt issue. As described in the section on methodology, if more than one consecutive debt issue of an issuer had a time interval of shorter than 50 continuous trading weeks, they were consolidated into one single event to make a comparison of the initial interest rate exposure and final exposure. Therefore, only 579 debt issue events were retained. The '*beta-pre-Glt*' and '*beta-pre-Gst*' denote the asset sensitivity to the long and short-term interest rates prior to the debt issues. The market condition variables, market values and market-to-book ratios were recorded for the debt issue dates generated from DataStream as the control variables employed in the multivariate hypotheses tests. Subject to several observations of the market-to-book ratios, some were discarded if the market-to-book ratio was negative or larger than 10, which meant a loss of eight observations[32]. All the explanatory variables corresponded to the dates of the debt issues.

In addition, based on the sample set of the debt issues, the corresponding data set of stock prices quoted from DataStream was built. For each observation, the daily observations of stock prices during the periods of 50 weeks before and after the event windows of the debt issues were collected to estimate the firms' asset

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[32] The sample size of 742 shown in Tables 2.1 and 2.2 already excluded these outliers.

interest rate exposures.

2.5. Empirical results and implications

2.5.1. Findings

The debt issue decision is one of the firm's most important financing choices. When deciding how to finance a project, the firm must choose between debt and equity. If debt is chosen, the interest rate yield type and the maturity of the debt must also be chosen. The choices of debt yield type and maturity are determined by comprehensive factors. From the risk management point of view, the impact of corporate debt issues on the firm's interest rate exposure raises the question as to whether firms consider hedging interest rate exposure when issuing debt or are simply timing the market to reduce the costs of capital. Thus, the behaviour which firms are engaged in during the process of raising debt funds is either hedging or speculating. The theory with respect to interest rate risk management by using debt funds is currently far from enough to support the corporate implementation of interest rate risk management. Moreover, few empirical studies have disclosed evidence that identifies the underlying intention of debt financing. As described earlier, two hypotheses are set forth in this study to examine the determinants of firms' debt issue decisions regarding the yield type and maturity choices. Apart from specific firm characteristics which determine a firm's debt financing, as suggested in previous studies, the main focus here is on the influence of interest rate exposure on corporate debt issues. This section presents the empirical findings of the hypotheses tests.

The main findings are as follows. Firstly, the impacts of the debt issues on the firms' initial interest rate exposure were examined. The results show that the firms' interest rate exposures changed significantly after issuing the debt. This change is more likely to be attributable to the natural influence of the newly issued debt than a designed result of the firm's purposeful strategy. Secondly, there was a

relationship between the debt issues and the exogenous market condition factors. All types of debt were affected by the debt market momentum. Meanwhile, the features of the debt issues were significantly related to the debt market condition factors. Finally, are firms considering hedging the interest rate exposure or timing the debt market when issuing debt? It is clear that it is the exogenous market factors rather than the firm-specific interest rate exposure that determine the yield type choice and maturity horizons of corporate debt issues. Put another way, the results support the market timing hypothesis.

2.5.2. Impacts of debt issues on firms' interest rate exposure

Although it may be intuitive to assume that new debt will affect the firm's interest rate exposure, a quantitative examination is necessary to verify this. The interest rate exposure before the debt issues and the changes in interest rate exposure after the debt issues were estimated to examine the hedging strategies it was assumed the firms were adopting and those they actually used. The stock price sensitivities to both the long and short-term interest rates were used as measures of the asset interest rate exposure, as shown in Model (2.1). Table 2.3 presents the overall results of the estimated interest rate exposures of all the debt issuers.

A comparison between the interest rate exposure prior to and after the debt issue events shows that more than 56% of the debt issue events (324 of 579)[33] significantly altered the initial interest rate exposure of the debt issuers by either creating additional risk exposure or cancelling out the original risk exposure. For example, in terms of short-term interest rate exposure, 106 initial interest rate exposures were significantly different from zero, but half of them were positive and the rest were negative. Only 26 of these 106 observations kept the interest rate exposure significantly positive, while the rest became insignificant after the debt issue events. In addition to the initial interest rate exposure, 114 after-event

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[33] This percentage is lower than we expected, which may potentially result from the relative magnitudes of the debt issued. In Section 5.5 we examine the size effect on firms' decisions regarding hedging or market timing.

interest rate exposures were significantly different from zero, 78 of which were not significant before the debt issue events. The signs of the estimated interest rate exposures showed no clear discipline. It is perplexing that the interest rate exposures did not exhibit a given tendency. Rather, the directions of the changes varied across the observations. Part of the initial interest rate exposures died out after the debt issues, while a considerable share of the sample created additional risk exposure. This casts a suspicion as to whether the changes to the firms' interest rate exposures after the debt issues can be attributed to purposeful strategies or were unintentional results. Therefore, it is necessary to examine the difference between the pre-issue and after-issue interest rate exposure for the sample as a whole.

By using the two sample t-test to examine whether the debt issues essentially changed the firms' interest rate exposures, it can be seen that the after-event interest rate exposure was larger than the initial interest rate exposure. On examination of only the significant sub-sample, which contains all significant pre and/or post-event interest rate exposures, it was found that the impacts on the interest rate exposure were more significant at the 5% level. Moreover, if the firms were intending to hedge the risk exposure, the after-event interest rate exposure should have significantly decreased or died out. In contradiction of the hedging hypothesis, the mean of the pre-event exposure was small and insignificant, while the after-event exposure became large and significant, which is in line with the prior assumption that debt is normally negatively related to the interest rate and this creates an incremental interest rate exposure for firms. Thus, Table 2.3 shows that the newly issued debt essentially changed the firms' interest rate exposures. Moreover, this change is unlikely to be due to a designed result conducted by the issuer. Instead, this result can be attributed to the impact of the debt issues on the firms' interest rate exposures.

Table 2.3 Impacts of Debt Issues on Firms' Interest Rate Exposure

The stock returns of 50 weeks prior to and after the dates when the corresponding individual debt is issued form the event windows for the estimates of the influences of new debt issues on the sensitivities of stock prices to the interest rate variability. If in the range of the window there are more than one debt issue events, they are consolidated into a sole event, and the window will be extended further. After this adjustment, there are 579 firm-issue observations remaining based on Table 2.1. For each observation, the weekly stock returns for the 50 week period prior to the debt issue are used to determine the sensitivity of the firm to changes in the short and long-term interest rates.

$$R_{i,t} = \alpha + \gamma R_{m,t} + \beta_{s,i} I_{s,t} + \beta_{l,i} I_{l,t} + \varepsilon_{i,t} \qquad (2.1)$$

$$R_{i,t} = \alpha' + \gamma' R_{m,t} + \beta'_{s,i} I_{s,t} + \beta'_{l,i} I_{l,t} + \varepsilon_{i,t} \qquad (2.1)'$$

where $R_{m,t}$ denotes the returns of the FTSE all index as the proxy for the market returns, $I_{s,t}$ is the weekly variations of the 3-month Treasury bill rates, and $I_{l,t}$ is the weekly variations of the 10-year Treasury bond rates. $B_{s,i}$, $B_{l,i}$, $B_{s,i}'$ *and* $\beta_{l,i}'$ measure the firms' interest rate exposures to the short-term and long-term interest rates before and after the debt funds were raised respectively. The differences between $B_{s,i}$ and $B_{s,i}'$, $B_{l,i}$ and $\beta_{l,i}'$ reflect the influence of the debt issue on the firms' interest rate exposure.

Panel A shows the differences between the interest rate sensitivities before and after the debt issue events for the whole sample. Panel B only covers observations which have at least one significant coefficient, in other words, the samples with a significant variation in interest rate exposure after the debt issue events (324 observations).

	$\beta_{l,i}$	$\beta_{l,i}'$	Difference	$\beta_{s,i}$	$\beta_{s,i}'$	Difference
Panel A Whole sample						
Mean	0.013	-0.192	[-1.372]*	-0.092	-0.442	[-1.270]*
SD	0.758	0.783		1.782	2.608	
Number of observations	579			579		
Panel B Significant sub-sample						
Mean	0.043	-0.473	[-2.751]**	-0.106	-0.427	[-1.452]*
SD	1.113	1. 682		3.973	2.691	
Number of observations	324			324		

* and ** correspond to the differences of each pair of variables being significant at 10% and 5% respectively, in respect of with the *t*-statistics of based on one-tailed mean comparison tests with unequal variances.

2.5.3. Exogenous effects on debt issues

This sub-section presents an examination, from the market-wide view, of how the yield types and maturities of the corporate debt issues were affected by the debt market conditions. The focus is on the aggregate time series data rather than the firm-level data because the aim was to examine the market-wide tendency of the debt issues as the debt market conditions vary, as corresponds to the aggregate version of Baker et al. (2003), who studied the market-wide decisions regarding the maturity of debt issues. This solely tests the second hypothesis regarding market timing. The debt issues were examined using the pooled firm-level data in the subsequent section to explore the cross-sectional differences resulting from variations in firm characteristics.

It seems intuitive to assume that the decisions firms make concerning yield type and maturity choices are affected by exogenous factors. An examination was first made to determine whether there was a debt market tendency regarding the debt issue choices. As described in the section 2.4, the quarterly aggregate debt issue observations were categorized by yield type and maturity length. The debt yield types were categorized as floating and fixed rate. On the other hand, the maturity lengths of the debt were divided into short, medium and long-term debt by five years and ten years. All types of debt were examined respectively to see whether they exhibited an obvious tendency, in other words, whether the past aggregate information regarding the debt issues had affected the firms' debt issue decisions in the subsequent period. It was found that the debt issues tended to increase over time, which may have been due to the growth of the economy or changes in fashion regarding the firms' financing policies. To control for growth in the economy, the time trend was introduced in the auto-regressions. Different lags in the respective tests were examined. Furthermore, the levels of the various types of debt scaled by the total issues during each period were examined to measure the changes in debt issues over time, which more accurately controlled for the effects of economic growth. Therefore, the time trend was not involved when measuring the level of debt issues.

Table 2.4 presents the results of the auto-regressions for all types of debt. Both the deal numbers and the aggregate issue values of the debt during each quarter were examined. All the variables exhibited a first order auto-correlation, but no variables of debt issues that were second order auto-correlated were found. Apart from the values of these variables, the percentage levels were also auto-correlated. These results suggest that the decisions of the firms' regarding their debt issues were affected by the market tendency. Moreover, all the significant coefficients were positive. Therefore there exists momentum effectiveness in the debt issue market. The increase of a given type of debt issue will lead to a further increase of the debt in the subsequent period. In addition, the coefficients of the time trend

were significant and stayed positive. This suggests that there indeed exists an increasing tendency of debt issues over time.

An important objective of this section is to explore the relationship between the corporate debt issues and the debt market conditions. Following the method employed above, an investigation was made, from the market-wide view, into whether the changes in debt market conditions predicted debt issues with different yield types and maturity horizons, or, put another way, whether the specific movement pattern of the debt market conditions provided greater incentives to the firms to issue specific types of debt. The market factors involved in the tests included inflation, real short-term interest rates and term spread. The contemporary relationship between the debt issue variables and the market factors was examined. One lag was taken for the market factors as the robustness check because from the results above, the levels of debt issues were first order auto-correlated, which suggests that the information for the quarter before the issue date influenced the debt issues at the market-wide level. The dependent variables were the time series of the aggregate deal numbers of debt with different yield types and maturities for each quarter. If the deal numbers of the quarterly aggregate debt issues are a noisy measure of the underlying debt market conditions, the levels of these variables (the sub-samples over the total sample) were also examined to more accurately measure the relationship between the debt issue preference and the debt market factors.

Table 2.5 shows the levels of all the debt types over the total debt issues, and it can be seen that all the dependent variables were significantly correlated to the market condition factors. Panel A shows that the floating-rate debt exhibited an opposite tendency to the fixed-rate debt under certain market conditions. In other words, the level of the floating rate debt was positively correlated to the market condition factors, while the level of the fixed rate debt moved in the opposite direction. Firstly, if the term spread decreased or there was a flat yield curve, the firms were

more likely to issue a fixed rate debt than a floating rate debt. This is consistent with Faulkender (2005) in that firms tend to issue a floating rate exposure when the yield curve is steep. Secondly, the positive signs of the coefficients suggest that, with high inflation and interest rates, firms prefer a floating rate to a fixed rate debt. Panel B shows that as the market condition factors varied the levels of short-term debt exhibited an opposite movement to those of the long-term debt[34]. The percentage of short-term debt increased as the real short-term rates suggested the lower cost of such debt. Moreover, as the yield curve of the term structure became steep, short-term debt became favoured over long-term debt because of concerns about capital costs. The issuances of the long-term debt exhibited a reverse pattern. Therefore, these results suggest that, at the market-wide level, firms adjust their debt maturity according to the debt market conditions. The evidence, as a whole, shows that firms make decisions regarding yield type and maturity based on responses to the current market conditions as well as expectations of market movements in the near future.

Several implications flow from these results. Clearly, in terms of the debt yield types, firms tend to select a less costly according to the exogenous market environment. Therefore, they will choose the floating rate for newly issued debt because the costs of capital implied by inflation and short-term rates are relatively high and are expected to be lower in the future. Otherwise, firms will prefer the fixed rate in order to lock in the "expected" increase in costs. A more implicit interpretation about yield type choices is that these market variables implicitly proxy for the time-varying costs of the interest rate risks. As suggested in Estrella and Mishkin (1996), a steep slope in the yield curve is correlated with a low likelihood of economic recession. During the non-recessionary time, the likelihood of distress is relatively low, and so the cost of bearing interest rate volatility may

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[34] One lag was taken for the market factors as the robustness check because it was found that all the dependent variables exhibited the first order auto-correlation, which suggests that the information for the quarter prior to the issue date influences the debt issues at the market-wide level. The results from the lead-lag relationship are similar to the contemporary tests examined earlier. In the interests of brevity, the lagged results have not been reported here. However, the results are available upon request.

be lower. Thus, firms are better able to endure interest rate exposure by choosing a floating rate. Conversely, firms tend to lock in their interest payments when the volatile interest rate payments are costly during economic recessions. The capital costs also explain the choices of debt maturity. Firms tend to shorten the maturity of new debt when the long-term rate is relatively too high compared to the short-term rate as implied by a steep yield curve. Meanwhile, when a low inflation and interest rates suggest a growth of economy, firms would be more confident to issue a long-term debt than a short-term debt as their ability of enduring risk exposure is relatively high. In short, the behaviour of market timing emerges from the corporate debt issues.

In summary, the range of evidence indicates that market timing is an important aspect of real debt financing decisions. This phenomenon is embodied in the debt issue market as a whole. On the one hand, the firm's debt issue is affected by the current tendency of the corresponding debt that reflects the expectations regarding future market movements. On the other hand, a firm's preference for choosing particular interest rate exposures and the maturity lengths for new debt varies according to the changes in debt market conditions in an attempt to time the market to reduce the costs of capital.

Table 2.4 Auto-correlation of Quarterly Deal Numbers and Values of All Types of Debt

$$d_t = a + bt_t + \sum_1^i c_i d_{t-i} + \varepsilon_t \qquad (2.3) \qquad\qquad \frac{d_t}{D_t} = a + \sum_1^i b_i \frac{d_{t-1}}{D_{t-1}} + \varepsilon_t \qquad (2.4)$$

where i is equal to 1 or 2 tested in the auto-regressions respectively. t_t represents the time trend to eliminate the growth of economy. However, the time trend is not involved when measuring the level of debt issues as shown in the regression (2.4), because the levels of debt issues have already controlled the economic growth. Sorted by yield types and the lengths of maturity, the dependent variable, d_t, in the regression (2.3) is replaced respectively by the quarterly aggregate deal number of the short and long-term debt issued (***Ds,t*** and ***Dl,t***), the quarterly aggregate deal value of the short and long-term debt issued (***Ms,t*** and ***Ml,t***), the quarterly aggregate deal number of the floating rate and the fixed rate debt issued (***Df,t*** and ***DF,t***), and the quarterly aggregate deal value of the floating and fixed rate debt issued (***Mf,t*** and ***MF,t***). In the regression (2.4), the dependent variable, d_t/D_t, is replaced respectively by the quarterly aggregate percentages of deal numbers and deal values of the fixed rate debt to the total debt issues (***DF/(DF+Df)*** or ***MF/(MF+Mf)***), and the quarterly aggregate percentages of deal numbers or deal values of the long-term debt to the total debt issues (***Dl/(Dl+Dm+Ds)*** and ***Ml/(Ml+Mm+Ms)***).

	Ds,t	***Dl,t***	***Ms,t***	***Ml,t***	***Df,t***	***DF,t***	***Mf,t***	***MF,t***	***DF/(DF+Df)***	***MF/(MF+Mf)***	***Dl/(Dl+Dm+Ds)***	***Ml/(Ml+Mm+Ms)***
t-1	0.355	0.142	0.276	-0.273	0.090	0.215	-0.244	0.271	0.338	0.221	0.145	-0.102
	[3.15]***	[1.21]	[2.41]**	[-2.38]**	[0.763]	[1.80]*	[-2.11]**	[2.33]**	[3.09]***	[1.92]*	[1.25]	[-0.855]
Constant	0.036	0.368	-247.004	-1050.590	1.087	-0.765	-1046.040	-417.084	0.415	0.489	0.117	0.235
	[0.0473]	[1.52]	[-1.54]	[-1.68]*	[1.55]	[-0.815]	[-1.612]	[-1.58]	[5.48]***	[5.96]***	[4.47]***	[5.83]***
Trend	0.073	0.013	20.276	62.514	0.050	0.156	69.053	37.693				
	[3.34]***	[2.31]**	[4.25]***	[4.16]***	[2.92]***	[4.83]***	[4.35]***	[4.45]***				
R-squared	0.436	0.118	0.497	0.204	0.157	0.571	0.213	0.553	0.117	0.048	0.021	0.010

	Ds,t	***Dl,t***	***Ms,t***	***Ml,t***	***Df,t***	***DF,t***	***Mf,t***	***MF,t***	***DF/(DF+Df)***	***MF/(MF+Mf)***	***Dl/(Dl+Dm+Ds)***	***Ml/(Ml+Mm+Ms)***
t-1	0.355	0.141	0.242	-0.279	0.101	0.179	-0.244	0.245	0.308	0.208	0.163	-0.111
	[2.93]***	[1.17]	[2.01]**	[-2.31]**	[0.849]	[1.48]	[-2.02]**	[2.01]**	[2.59]**	[1.73]*	[1.39]	[-0.914]
t-2	-0.006	-0.010	0.110	-0.017	-0.149	0.164	0.008	0.086	0.040	-0.009	-0.166	0.004
	[-0.0479]	[-0.0832]	[0.918]	[-0.138]	[-1.25]	[1.33]	[0.0647]	[0.702]	[0.342]	[-0.0769]	[-1.41]	[0.0321]
Constant	-0.052	0.395	-232.520	-1124.430	1.281	-0.714	-1091.200	-397.936	0.405	0.500	0.139	0.239
	[-0.0656]	[1.55]	[-1.37]	[-1.69]*	[1.75]*	[-0.727]	[-1.58]	[-1.40]	[4.46]***	[4.90]***	[4.67]***	[4.85]***
Trend	0.0753833	0.0128602	18.4639	64.673	0.0574096	0.132424	69.6233	34.9082				
	[3.06]***	[2.10]**	[3.38]***	[3.75]***	[3.07]***	[3.34]***	[3.79]***	[3.45]***				
R-squared	0.435	0.109	0.501	0.205	0.164	0.583	0.212	0.554	0.107	0.042	0.046	0.012

*,**, and *** correspond to the coefficients being significant at 10%, 5%, and 1% respectively.

Table 2.5 Firms' Decisions on Bond Issues and Debt Market Conditions

Regressions of the variables regarding bond issues on inflation (*INF*), the real short-term rate (*Gs-INF.*), the term spread (*Gl-Gs*).

$$D_t = a + b_1 INF_t + b_2(G_{st} - INF_t) + b_3(G_{Lt} - G_{St}) + \varepsilon_t \qquad (2.2)$$

Covering all 742 debt issue observations, the samples are sorted by yield types and maturities, and the deal numbers are accumulated for each quarter from 1986-2004 (76 quarters altogether). Inflation (***INF***) is the real quarterly inflation generated from the announced UK consumer price index (***CPI***). The real short-term rate (***Gst-INF***) is estimated as the three-month Treasury bill rate minus actual inflation. The term spread (***Glt-Gst***) is the difference between the 10-year Treasury bond rate and the three-month Treasury bill rate. The independent variable, ***Dt,*** is replaced by the variables shown in the first column. Panel A exhibits the aggregate percentages of the debt issues deal numbers sorted by the yield types, i.e. the floating rate debt (D_f), and the fixed rate debt (D_F) to the total issued debt during each quarter. Panel B exhibits the aggregate percentages of the debt issues deal numbers sorted by the maturity, i.e. the short-term debt, D_s, (with maturity shorter than 5 years), the medium-term debt, D_m, (with maturity between 5 and 10 years), and the long-term debt, D_l, (with maturity longer than 10 years) to the total issued debt during each quarter. T-statistics are heteroskedasticity robust and correct for time-series dependence up to 2 lags.

Dt	*N*	*INF*		*Gst-INF*		*Glt-Gst*		*Constant*	*R-Square*
		b1	[t]	b2	[t]	b3	[t]		
Panel A Sub-group sorted by the yield types									
The fixed-rate bond share of total bond issues									
DFt/[dFt+dft]	76	-0.074	[-3.45]***	-0.054	[-1.67]*-	0.072	[-2.65]**	0.909 [7.90]***	0.140
The floating-rate bond share of total bond issues									
Dft/[dFt+dft]	76	0.046	[2.12]**	0.032	[1.59]*	0.064	[2.33]**	0.128 [1.09]	0.116
Panel B Sub-group sorted by the maturity									
The short-term share of total bond issues									
Dst/[dLt++dMt+dSt]	76	0.044	[2.67]***	0.005	[1.77]*	0.020	[2.12]**	0.082 [2.94]***	0.105
The medium-term share of total bond issues									
Dmt/[dLt++dMt+dSt]	76	0.021	[1.83]*	-0.006	[-0.286]	0.015	[1.89]*	0.512 [4.49]***	0.045
The long-term share of total bond issues									
Dlt/[dLt++dMt+dSt]	76	-0.051	[-2.52]**	-0.026	[-2.19]**	-0.048	[-1.99]**	0.135 [2.28]**	0.127

*,**, and *** correspond to the coefficients being significant at 10%, 5%, and 1% respectively.

2.5.4. Hedging or market timing

Since the market-wide aggregate data ignores the cross-sectional variations in the firm-specific characteristics, the cross-sectional firm-level data will be better able to identify the differences in preferences of debt financing. Both the hypotheses of hedging and market timing were examined by involving the first-specific interest rate exposure generated from the stock price sensitivity to the long and short-term interest rates, and the debt market variables employed in the previous section as well as controlling for firm size and market-to-book ratios to reveal the determinants of the corporate debt issues regarding the yield type choices and the length of maturity. It has been assumed that if firms are hedging the interest rate exposure the yield type choice and debt maturity should be determined by the interest rate exposure before the debt issue. If firms are timing the debt market, their choices of debt issues will be driven by the market variables.

Probit regressions were employed to identify the likelihood of the yield type choices, i.e. floating or fixed rate debt, and the length of the debt maturity, i.e. long or short-term. To eliminate the potential bias resulting from the subjective definitions of long-term and short-term, the tobit regressions on the debt maturity were also examined. Table 2.6 presents the results of this analysis. The first thing to notice is that the firms' initial interest rate exposures (betas) do not predict the probability of the choices made as regards yield type or debt maturity. If the firms were hedging, the sign of the coefficient for the beta should be positive, suggesting that they were matching the exposure of their assets to the exposure of their debt. However, the coefficient in the results is statistically insignificant[35] and does not

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[35] Since the interest rate exposure, β, are not fixed, but estimated in the time-series regression (2.1), the estimated errors of the coefficients are asymptotic. Therefore the Shanken's correction is made to adjust the standard errors of the β coefficients. Following Shanken's (1992), the adjusted standard error of the estimated coefficients of in the regression (2.5) is $Ad.Se = \sqrt{(1+c)(Se^2 - Var_{I_1}/T) + Var_{I_1}/T}$, where $c = \lambda^{-1}\sum_f^{-1}\lambda$, λ is the coefficient matrix of factors in the time-series regression (2.1), Σ_f is the covariance matrix of factors in time-series regression (2.1). We obtained c_1=0.34 for all sample (panel A, Table 2.3) and c_2=0.57 for significant interest rate exposure (panel B, Table 2.3) respectively, and adjusted the standard errors and t-values of β coefficients in Table 2.6. The t-values of β coefficients in Table 2.7 and Table 2.8 have been adjusted as well. All adjustments of coefficients and standard errors are verified by Litzenberger/Ramaswamy

exhibit the expected sign for the above analysis. This suggests that the firms with a positive interest rate exposure were no more likely to have floating rate debt or a specific length of debt maturity than those with a negative exposure. Therefore, this finding does not support the hypothesis that firms are hedging the interest rate exposure when choosing the yield type and maturity of new debt.

To examine whether firms really were not matching the firm-specific interest rate sensitivity of their assets to their liabilities, or whether the measure is just mis-specified, the alternative measures of the asset interest rate exposure, $\beta_{l,i}$ and $\beta_{s,i}$, were also examined using the robustness checks. Firstly, the value of the estimated long-term and short-term interest rate exposure, $\beta_{l,i}$ or $\beta_{s,i}$, was taken only where it was statistically significant in Equation 2.1 and took a value of zero otherwise. Secondly, following Faulkender (2005), a discrete measure of the interest rate exposure, $\beta_{l,i}$ and $\beta_{s,i}$, was also used, which took the value of positive one (+1) when the estimated exposure, $\beta_{l,i}$ or $\beta_{s,i}$, wa s significantly positive, negative one (-1) when it was significantly negative, and zero otherwise. This specification was adopted because firms are assumed to adopt different hedging strategies if the interest rate exposures that they face have different signs. More specifically, firms that face a positive asset interest rate exposure will benefit from the floating rate debt in the reduction in the volatility of stock prices resulting from interest rate movements. The results of these two additional specifications are reported accompanying with the initial one in Table 2.6. The results from using these specifications are nonetheless similar to the above finding that initial interest rate exposures do not affect choice of yield type or debt maturity. The only weak significance appears with the coefficient of the discrete long-term interest rate beta[36] but accompanies a negative coefficient (supposed to be positive if hedging hypothesis holds) of the short-term interest rate beta in the regression (2.5c). Therefore, the results show that hedging the firm-specific asset interest rate risk

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estimator following Lehmann (1990) as well.

[36] We doubt the potential reason is due to the relative magnitude of the debts or the outliers, since in the robustness check we found the same phenomenon on, and only on, the *large size* issues, when we divided the whole sample into two sub-groups by the relative sizes.

may not have been a primary objective of the firms. This finding does not support the hypothesis that firms are hedging the interest rate exposure when choosing the yield type and maturity of new debt.

When looking at the market condition factors, it can be seen that all market condition factors are significantly correlated to the choices of debt yield type. The coefficients of both the inflation and term spread were significant at the 1% level. Moreover, the magnitudes of the coefficients imply an economic significance. Thus, firms are more likely to issue a fixed rate debt when the inflation and the short-term rate are low because they are expecting to lay off the risks of capital costs increases. Moreover, the term spread was positively related to the probability of floating rate debt instruments and negatively related to the firm's preference for fixed debt issues, suggesting that the firms were more likely to lock in their interest payments when there was only a small difference between the long and short-term interest rates than when the difference was large, because the steep yield spread curve implies a less likely economic recession than a flat one. Therefore firms can bear more interest rate risks by choosing a floating rate debt as the economy expands.

The horizon of debt maturity (2.5c) is also determined by inflation and term spread of interest rates. The significantly positive coefficients suggest that, with high inflation and real short-term rate, the firms tended to lengthen the maturity of their new debt. As for term spread, firms would appear to issue long-term debt if the term spread was high and expected to decrease. This finding was robust when the dependent variable of debt maturity was specified as a dummy defined by a short and long-term debt discretely, except a weaker significance of real short-term rate which may potentially be subject to the manually separation of short-term and long-term debt.

In terms of the control variables, the results show that the debt maturities were negatively related to firm size in both specifications of discrete and continuous

maturity, which implies that large firms issue more short-term debt than small firms. This result is counterintuitive at the first glance, as a number of studies suggest that large firms issue more long-term debt. However, the pecking order of a firm's financing decision may explain this result. If the costs of financing determine that internal funds are preferred to external funds, larger firms have a greater capability to finance themselves internally, unless the internal cash flows are not enough to support the investment project. In this case, large firms will raise short-term debt to temporarily fill the funding gaps. In contrast, small firms rely more heavily and chronically on external funds. This is in line with Guedes and Opler (1996), regarding the "clientele effect". They suggest that higher quality firms tend to borrow at both ends of the maturity spectrum, while larger firms with higher growth opportunities are more likely to issue short-term debt. The deeper implication of this finding is that more short-term debt is issued by large firms when the market conditions suggest a low cost of short-term debt. Therefore, large firms are more capable to react to the changes in debt market conditions, which is consistent with the findings in the survey of Graham and Harvey (2001). Collectively, the result is not surprising. However, there was no obvious evidence that firm size significantly affected yield type choice.

Table 2.6 Determinants of Corporate Debt Issues

This table examines whether the choices of debt issuers are determined by the firm-specific interest rate exposure or the debt market conditions, controlling for firm size and the MTBV ratios.

$$D_{f,t} = a + b_1\beta_{s,i} + b_2\beta_{l,i} + c_1 INF_t + c_2(G_{st} - INF_t)_i + c_3(G_{Lt} - G_{St})_i + d_1 MV_i + d_2 MTBV_i + \varepsilon_i \quad (2.5a)$$

$$D_{m,t} = a + b_1\beta_{s,i} + b_2\beta_{l,i} + c_1 INF_t + c_2(G_{st} - INF_t)_i + c_3(G_{Lt} - G_{St})_i + d_1 MV_i + d_2 MTBV_i + \varepsilon_i \quad (2.5b)$$

$$M_i = a + b_1\beta_{s,i} + b_2\beta_{l,i} + c_1 INF_t + c_2(G_{st} - INF_t)_i + c_3(G_{Lt} - G_{St})_i + d_1 MV_i + d_2 MTBV_i + \varepsilon_{ii} \quad (2.5c)$$

The sample covers all 579 firm-issue observations with the short-term and long-term interest rate exposure. In the regression (2.5a), the dependent variable, $\boldsymbol{D_{f,i}}$ takes the value of 1 if the final yield type of the debt fund is floating, and 0 otherwise. Regression (2.5b) and regression (2.5c) replace the dependent variables respectively by the dummy variable of the bond maturity, $\boldsymbol{D_{m,i}}$, which takes on the value of positive one (+1) if the maturity is shorter than 5 years, negative one (-1) if the maturity is longer than 10 years, and 0 otherwise, and the years to maturity of bonds, $\boldsymbol{M_i}$, respectively.

For each regression, the interest rate betas, which include all beta values of the whole sample, are replaced by alternative specifications. The interest rate beta (significant exposure) only involves the values which are significantly different from zero, and take the value of zero otherwise. The discrete interest rate beta takes the value of 1 if the estimated beta is positively significant, -1 if negatively significant, and 0 otherwise.

$B_{s,i}$, and $B_{l,I}$ measure the firm's interest rate exposures to the short and long-term interest rates before the debt funds were raised respectively, estimated by the regressions of the short and long-term rates on the stock returns corresponding to 50 weeks prior to the debt issue as shown in regression (2.1) in Table (2.3). Debt market factors involve the inflation, INF_t, the real interest rate (the difference between 3-month Treasury bill rates, G_{st}, and the inflation, INF_t) and the term spread (the difference between the 10-year Treasury bond, G_{lt}, and 3-month Treasury bill rate, G_{st}) in the model. These factors correspond to the month when the debt is issued. Control variables, including firm size, MV_i, (take natural log) and the market-to-book-value ratio, $MTBV_i$, are generated from the monthly data corresponding to the time when the bonds are issued.

Number of observations (N=579)	Df (2.5a)			Dm (2.5b)			M (2.5c)		
Interest rate exposure									
Long-term interest rate beta	0.009			-0.020			0.858		
	[1.13]			[-1.38]			[1.10]		
Short-term interest rate beta	0.007			-0.020			-0.122		
	[1.26]			[-1.2]			[-0.512]		
Long-term interest rate beta		0.016			-0.007			1.137	
(Significant exposure)		[1.19]			[-0.325]			[0.846]	
Short-term interest rate beta		0.009			-0.015			-0.212	
(Significant exposure)		[1.19]			[-1.09]			[-0.619]	
Discrete long-term interest rate beta			0.106			0.100			1.132
			[0.98]			[0.936]			[1.30]
Discrete short-term interest rate beta			0.045			-0.073			-1.360
			[0.87]			[-0.764]			[-0.571]
Market timing									
Inflation	0.055	0.055	0.053	-0.044	-0.037	-0.038	1.476	1.440	1.384
	[3.43]***	[3.41]***	[3.33]***	[-2.15]**	[2.18]**	[2.12]**	[2.09]**	[2.04]**	[1.96]**
Real short-term rate	0.018	0.018	0.016	-0.015	-0.014	-0.012	1.529	1.608	1.501
	[2.12]**	[2.10]**	[2.01]**	[-1.71]*	[-1.56]	[-1.40]	[2.17]**	[2.29]**	[2.12]**
Yield spread	0.052	0.050	0.052	-0.064	-0.062	-0.059	0.956	0.838	0.869
	[2.77]***	[2.67]***	[2.82]***	[-2.43]**	[-2.42]**	[-2.36]**	[2.17]**	[2.03]**	[2.06]**
Control variables									
Market value (LgMV)	-0.018	-0.020	-0.020	0.109	0.116	0.115	-2.455	-2.543	-2.605
	[-1.21]	[-1.36]	[-1.37]	[4.20]***	[4.45]***	[4.41]***	[-3.87]***	[-4.02]***	[-4.12]***
Market-to-book-value ratio	0.001	0.001	0.001	-0.003	-0.003	-0.003	-0.100	-0.111	-0.118
	[0.426]	[0.342]	[0.238]	[-0.678]	[-0.640]	[-0.735]	[-0.971]	[-1.07]	[-1.13]
Constant	0.250	0.268	0.276	-1.125	-1.146	-1.101	24.364	24.854	25.766
	[1.69]*	[1.82]*	[1.86]*	[-4.24]***	[-4.29]***	[-4.11]***	[3.75]***	[3.83]***	[3.95]***
Pseudo R - squared	0.095	0.099	0.098	0.053	0.043	0.043	0.088	0.089	0.086

*,**, and *** correspond to the coefficients being significant at 10%, 5%, and 1% respectively. The t-values of beta coefficients have been adjusted by the Shanken's correction (see footnote 35 for details).

2.5.5. Robustness checks

There are still other possible interpretations for the firms' choices of yield types and maturity. It is suspected that managers really do feel confident in timing the debt market regardless of the risk exposure. At least, thus far it cannot be confirmed whether or not the managers always successfully benefit the shareholders by timing the market. It is assumed that the larger the debt, the riskier it is to speculate. Firms may only respond to the market conditions when issuing debt that is small in comparison to the firm's market value. To test this possibility, the whole sample was divided based on the size of the issue relative to the firm's market value. If the size of a newly issued debt as a percentage of the firm size was smaller than the average, it was regarded as a small debt otherwise it was a large debt. The two sub-groups were examined separately by looking at both yield types and maturity following the procedure implemented with the determinants of the debt issues in the preceding section. The results in Table 2.7 show that both the large issues and the small issues exhibited a similar pattern regarding the firm-specific risk factors and the market condition factors, which is consistent with the general conclusion of Faulkender (2005) concerning the size effect. It can be seen that the coefficient significance of the market factors in the large-size sample was weaker than that of the small-size sample, while the coefficient of the long-term interest rate beta exhibited a weak significance and an expected sign of hedging. The explanation for this is that firms do indeed view market timing as an overly risky strategy. As a result, firms are more likely to make this decision in relation to small-size issues but are more cautious when issuing a large debt.

It was also taken into consideration whether the credit rate would affect the choice of debt yield type and maturity, because the credit rate of a debt is the benchmark used to measure the risk level of the debt. Besides the firm's financial characteristics *per se*, the credit rate of a new debt depends on yield type and length of maturity. Therefore, firms may consider raising the credit rate by

designing the debt structure. If the firm attempts to lower the exposure of a newly issued debt and its overall risks, the credit rating of the new debt will reflect the firm's intention. As a result, the credit rate should influence the firm's choice of debt yield type and maturity. Otherwise it is possible that the firm has an objective other than hedging the interest rate exposure. Using the credit rates generated by the Security Data Corporation (SDC), the whole sample was separated using the S&P credit rating. That is, the corporate debt with a credit rate of *A* or above was regarded as high rating debt, otherwise low rating debt. A dummy variable of the credit rate was introduced to examine the relationship between the credit rates and debt structure. It took the value of one for the high rating debt and zero for the low rating debt. An examination was made of both debt yield type and maturity and implemented as in the preceding tests. Table 2.8 presents the results regarding the relationship between the debt credit rates and the debt structures of the new issues. However, no convincing evidence was found that the credit rates affected the firms' debt structures of new issues. The coefficient of the credit rate dummy variable was not significant in any of specifications. Moreover, little change occurred in the magnitudes or significances of the other variables, which is consistent with the preceding main results. Therefore, the firms were not trying to raise the credit rate and lower the interest rate risk exposure by effectively designing a debt structure regarding the yield types and maturities for their new debt.

An examination was also made of the effects on the corporate debt issues caused by differing preferences and features across different industries, which might potentially distort the results regarding the determinants of the firms' debt issues. Using the industrial categories and definitions of the SDC, the whole sample covers the debt issues of firms from nine industries[37]. Eight dummy variables were introduced to control for the industrial effects on the corporate debt issues, with the base of High Technology industry, i.e. when all dummy variables are taken value on zero. In Table 2.8 the results show that, except for the *Consumer Staples* and

[37] The industry categories include *Materials, Energy & Power, Consumer Staples, Retail, Media & Entertainment, Industrials, Healthcare, Consumer Products & Services, and High Technology.*

Healthcare industries, the majority exhibited different preferences when choosing specific yield types or debt maturities for new issues. They consistently responded to the changes in the debt market conditions regardless of their own interest rate exposure. The fact that there was little variety in the magnitude and significance of the coefficients of any other factors supports the preceding indication that the debt market condition factors rather than the firm-specific interest rate exposure determine the choice of debt issue. On the other hand, the industrial effect on corporate debt issue choice also suggests that, to some extent, the industrial features and economic conditions do affect the firm's debt issue policies.

In summary, this chapter shows that the choices of yield type and debt maturity are significantly correlated to the market condition factors rather than firm-specific interest rate exposure under all of the specifications. The results, taken as a whole, are most naturally explained by the notion that the firm's choices of debt issues concerning the yield types and the lengths of maturity were determined by the debt market conditions with the intention of lowering the costs of capital. Therefore, the primary purposes of selecting interest rates and deciding on debt maturity is to time the interest rate market in order to manage market-wide risk, rather than hedging firm-specific interest rate exposure.

Table 2.7 Size Effect on the Debt Issue Structure

This table shows the results of the regressions on the sub-samples categorized by the relative debt issue size. The sample covers all 579 firm-issue observations with the short-term and long-term interest rates exposure, $B_{s,i}$, and $B_{l,i}$ in Table 2.3. The whole sample is divided into two sub-samples, small size debt and large size debt, defined by the ratios of the debt principal over the firm's market value. Out of the whole sample, the newly issued debts with a ratio larger than the average are sorted into the group of the large size debt, (153 observations), otherwise small size debt (426 observations). Other notations in the regressions are the same as those in Table 2.6.

	Small Size issuance (N=426)			Large Size Issuance (N=153)		
	Df	**Dm**	**Maturity**	**Df**	**Dm**	**Maturity**
Interest rate exposure						
Long-term interest rate beta	0.012	-0.019	0.637	0.090	-0.074	0.689
	[1.29]	[-1.49]	[0.985]	[1.25]	[-0.999]	[1.52]
Short-term interest rate beta	0.008	-0.020	0.030	-0.190	0.192	0.146
	[1.18]	[-1.46]	[0.115]	[-1.35]	[1.31]	[0.734]
Market timing						
Inflation	0.064	-0.047	1.140	0.023	-0.062	0.071
	[3.37]***	[-2.17]**	[1.95]**	[1.86]*	[-2.18]**	[1.83]*
Real short-term rate	0.017	-0.012	1.933	0.007	-0.012	1.038
	[2.10]**	[-1.63]	[2.5]**	[1.58]	[-2.62]**	[1.93]*
Yield Spread	0.064	-0.068	0.532	0.080	-0.029	0.473
	[2.78]***	[-2.41]**	[2.07]**	[1.66]*	[-2.31]**	[2.14]**
Control variables						
Market value (LgMV)	-0.012	0.082	-1.527	-0.001	0.089	-1.515
	[-0.555]	[1.99]**	[-1.76]*	[-0.252]	[1.63]	[-2.54]**
Market-to-book-value ratio	-0.001	0.000	-0.116	0.001	0.006	-0.009
	[-0.448]	[0.0112]	[-1.13]	[1.07]	[0.98]	[-0.92]
Constant	0.222	-0.807	16.090	0.517	-0.052	-0.362
	[0.993]	[-1.88]*	[1.8]*	[3.97]***	[-0.38]	[-1.96]**
Pseudo R - squared	0.091	0.131	0.172	0.046	0.187	0.389

*,**, and *** correspond to the coefficients being significant at 10%, 5%, and 1% respectively. The t-values of beta coefficients have been adjusted by the Shanken's correction (see footnote 35).

Table 2.8 Credit Rates and the Industrial Effects

This table shows the results of regressions which involve the credit rate of new debt and 8 dummy variables for the industrial factors. The sample covers all 579 firm-issue observations with the short-term and long-term interest rates exposure, $B_{s,i}$, and $B_{l,i}$ in Table 2.3. The credit rate dummy takes the value of one if the credit rate of the debt is A or above (199 debt issues) according to the Standard & Poor's debt rating, and takes a value of zero otherwise (380 debt issues). The industries in the whole sample include *Materials, Energy & Power, Consumer Staples, Retail, Media & Entertainment, Industrials, Healthcare, Consumer Products & Services, and High Technology.* Eight industry dummy (with the base of High Technology industry, i.e. when all dummy variables are taken value on zero) variables are introduced to the regression to reveal the industrial characteristics. Other notations in the regressions are the same as those in Table 2.6.

	Df	**Dm**	**Maturity**	**Df**	**Dm**	**Maturity**
Interest rate exposure						
Long-term interest rate beta	0.009	-0.014	0.864	0.011	-0.009	0.824
	[1.27]	[-1.11][1.07]		[1.58]	[-0.675]	[1.55]
Short-term interest rate beta	0.007	-0.019	0.123	0.007	-0.018	0.136
	[1.42]	[-1.22]	[0.597]	[1.59]	[-1.21]	[0.657]
Credit Rating	-0.001	0.257	0.245			
	[-0.0165]	[0.96]	[0.115]			
Market timing						
Inflation	0.055	-0.042	1.483	0.057	-0.034	1.383
	[3.41]***	[-2.18]**	[2.09]**	[3.51]***	[-1.67]*	[1.93]*
Real short-term rate	0.018	-0.014	1.524	0.016	-0.017	1.510
	[2.12]**	[-1.73]*	[2.15]**	[2.02]**	[-1.54]	[2.12]**
Yield Spread	0.052	-0.064	0.956	0.051	-0.054	0.806
	[2.77]***	[-2.42]**	[2.17]**	[2.75]***	[-2.19]**	[1.98]**
Control variables						
Market value (LgMV)	-0.017	0.070	-2.492	-0.022	0.082	-2.464
	[-1.07]	[2.42]**	[-3.50]***	[-1.44]	[3.05]***	[-3.65]***
Market-to-book-value ratio	0.001	-0.005	-0.102	0.001	0.000	-0.119
	[0.423]	[-1.10]	[-0.976]	[0.565]	[-0.0526]	[-1.12]
D1				-0.279	-0.419	-6.568
				[-2.21]**	[-1.88]*	[-2.17]**
D2				-0.339	-0.637	-2.759
				[-2.78]***	[-2.98]***	[-1.65]*
D3				-0.170	-0.063	-7.307
				[-1.37]	[-0.289]	[-1.33]
D4				-0.341	-0.236	-5.862
				[-2.70]***	[-1.06]	[-1.05]
D5				-0.295	-0.575	-2.864
				[-2.36]**	[-2.62]***	[-2.56]**
D6				-0.367	-0.708	-4.155
				[-2.92]***	[-3.21]***	[-2.74]**
D7				-0.123	-0.451	-7.337
				[-0.758]	[-1.58]	[-1.02]
D8				-0.362	-0.576	-12.339
				[-2.27]**	[-2.06]**	[-1.75]*
Constant	0.153	-0.918	24.562	0.570	-0.508	29.770
	[1.62]*	[-3.37]***	[3.65]***	[3.00]***	[-1.52]	[3.53]***
Pseudo R - squared	0.095	0.068	0.088	0.077	0.124	0.100

*,**, and *** correspond to the coefficients being significant at 10%, 5%, and 1% respectively. The t-values of beta coefficients have been adjusted by the Shanken's correction (see footnote 35).

2.6. Conclusion

Early works on corporate risk management have assumed that firms use derivatives only for hedging purposes. An implicit assumption of this is that firms not using derivatives are not hedging. However, theory tells us that firms can manage their risk exposure by means other than derivatives. For instance, corporate bonds *per se* can be employed as an effective instrument for interest rate risk management. By correctly choosing the interest rate sensitivities of their equities and liabilities, firms can hedge their interest rate exposures by issuing debt. Following this logic, an examination was made of whether firms make full use of debt issuances for hedging purposes or whether they have other considerations.

Corporate debt issues essentially change the firm's interest rate exposure. By matching the interest rate exposure of new debt to the initial asset interest rate exposure, the firm can eliminate or reduce the asset sensitivity to interest rate volatility and then hedge the interest rate exposure. Setting the hypotheses that firms are trying to hedge the interest rate exposure by issuing debt and/or firms are timing the market for the purpose of reducing the capital costs, the primary objective of issuing the corporate debt was examined. However, it was found that the firms seemed to pay no attention to hedging interest rate risks when issuing their debt. On the contrary, their choices of debt yield types and maturity were primarily driven by the debt market conditions in an effort to reduce the costs of capital.

The fact that the firm's interest rate exposure, as regards assets, significantly changes after issuing new debt was verified. The firms' asset interest rate exposures were estimated by the stock price sensitivity to both the long and short-term interest rates prior to and after the debt issue events. Although the initial risk exposure varied across firms, being either positively or negatively correlated to the interest rates, the two-sample t-test shows that the after-event interest rate exposure was, on average, negative and significantly larger than the pre-event risk

exposure with very little change in the standard deviation in the sample as a whole. This is unlikely to be the result of firms' designed hedging strategies. Therefore, debt issues enlarge the firm's interest rate exposure rather than lowering it, as would be the result in the case where the firm was attempting to hedge risk exposure.

It was found that at the market level, both the interest rate choices and the maturity lengths of the debt issues were closely connected to the debt market conditions, specifically, the inflation, the real short-term interest rate and the term spread. When the inflation, real short-term interest rate and term spread were high, both the deal numbers and the levels of floating rate and long-term debt were significantly higher than those of the fixed rate and short-term debt. Interestingly, these relationships were pronounced in both the contemporaneous and one-lag tests. This suggests that firms tend to issue floating rate and long-term debt as these economic indicators suggest the costs of capital are predictably low. This implication can be explained by the market timing theory, which is simply that firms switch between fixed and floating rates and decide the length of debt maturity for their debt issues in an attempt to time the debt market. Market timing theory implies that firms experience a risk-return trade off between bearing interest rate volatility and taking the risk premium as the economic indicators vary. Inflation, the real short-term interest rate and the term spread play the roles of economic indicators for the likelihood of expected economic recession, which are also the proxies for the time-varying cost of interest rate risk. High economic indicators imply a low likelihood of an economic recession suggesting low expected financial distress costs. Therefore, firms can bear interest rate volatility during economic expansion times more than in economic recession periods, and then seek higher risk premiums. This explains the results that, at the market level, the firms issued more floating rate and long-term debt when the market condition factors suggested a good economic environment. Conversely, the firms were more likely to lock in their interest rate payments as regards debt or shorten the debt

maturity in order to reduce the potential costs resulting from volatile interest rates during an economic downturn.

If the significant relationship between the market variables and firms' choices of debt yield types and maturity suggests that firms are timing the debt market, the evidence that debt issues are dependent on the preceding market tendencies corresponding to given types of debt implies the effect of the aggregate information on the firm's decision regarding its debt issues. It was found that all types of debt, categorized by interest rate choices and lengths of maturity, were auto-correlated. Firms refer to the choices of other debt issuers in the current market to decide whether the new debt is adapted to the floating rate or the fixed rate as well as the long or short-term. Firms may believe that the current debt market already contains all available information regarding the expected market movements and the optimal debt choices. Therefore, the fact that exogenous debt market factors determine firms' decision regarding debt issues suggests that firms try to time the debt market using publicly available market conditions as a guide to their selection of interest rate and maturity length for their debt issues.

If the aggregate market-wide data ignores the cross-sectional difference in behaviour due to variations in firms' characteristics, the firm-level data is better able to examine the hypotheses regarding the underlying purpose of debt issue decisions. By involving both the firm-specific interest rate exposures before the debt issues and the debt market variables at the time the debt was issued, the dominant factors of the firms' debt issue choices were explored. The results show that the initial interest rate exposure provided no prediction power as regards either interest rate choices or the length of debt maturity, even when alternative specifications were employed to measure the interest rate exposure. By contrast, evidence was found that debt market factors determined the firms' decisions regarding their newly issued debt. The firms tended to issue long-term and floating rate debt when the debt market factors suggested that the expected capital costs

were predictably low.

Firm size is a strong determinant of debt maturity. Smaller firms have a greater incentive to issue long-term debt than do larger firms. An interpretation of this result is that large firms have a greater capacity for financing themselves using internal cash flows which are less costly than external funds, while smaller firms rely more on external funds chronically.

In conclusion, it was found that the firms' choices of debt issues were primarily driven by the debt market conditions and were employed in an effort to lower the costs of capital rather than to manage firm-specific interest rate exposures. The evidence suggests that market timing rather than hedging was the primary motivation behind the corporate debt issues. Thus, the findings have added evidence to the growing field of behavioural corporate finance that sees managerial decisions as being primarily driven by market conditions and managers' desires to time the market. However, the evidence of debt market timing raises further questions. Are there debt market inefficiencies and frictions that can be caught by firms' strategies of risk management with the objective of generating risk premium? Does the market timing evidence provide proof that firms switch among various types of debt according the market condition variations successfully? Do managers possess informational advantages regarding their prediction of market movements? If not, how do they make choices about debt issuance? These questions are examined in the following chapter.

Chapter 3: Debt market timing: Successful prediction or passive reaction?

3.1. Introduction

3.1.1. The opinion divergence of market timing

Market timing refers to managers' actions of capitalizing on temporary mispricing, specifically, issuing overvalued securities and repurchasing undervalued securities. However, this notion contains a multitude of implications. It is crucial to first clarify the meaning of managerial market timing. The view in the literature with respect to managerial market timing actually mixes two different concepts. First, "timing" means that managers use current and historical information to *successfully* forecast future price changes or market movements. Second, managerial market timing implies only that managers *try to* predict future price changes, but may or may not fare any better than other market participants. There is an important difference between managers trying to lower their cost of capital, and managers successfully lowering their cost of capital through such timing efforts. It is provocative to think that corporate managers may have better access to internal information than outside investors do. However, this does not mean they have greater access to market level information. Conceivably, timing the market can increase shareholders' value if it enables managers to exploit market inefficiencies thus reducing a firm's capital costs. However, if overconfidence leads managers to believe that they have superior information or ability relative to other market participants when they do not, managers acting on their market views may in fact destroy firm values. Although Baker, Greenwood and Wurgler (2003) examined the maturity timing decisions of debt issues that had been highlighted in some survey studies and suggested that managers are trying to time the debt market, they admitted that "it is difficult to tell whether managers succeed in reducing the overall cost of capital (p.289)", and so this remains open to question.

The market timing hypothesis indeed challenges the efficient market hypothesis. The efficient market hypothesis implies that all available information is reflected in the asset prices so that corporate managers cannot, on average, successfully predict future market returns. In other words, even if managers try to anticipate future market movements, they cannot systematically succeed in timing the market. In the case of weak market efficiency, there may be narrow windows of arbitrary opportunities for the market participants who have informational advantages over others before the information is fully communicated. Managerial market timing implies that corporate managers make use of market imperfections with their informational advantages on security prices to add value to firms or lower the costs of capital. However, if they do not possess informational advantages, but base their timing only on public and historical information, or simply react to market variations, there is no reason why they should succeed.

A number of survey studies (e.g. Graham and Harvey (2001), and Bancel and Mittoo (2004)) have discovered that managers attempt to time the debt markets when making their debt issuance decisions by issuing debt when interest rates are particularly low. There have also been empirical studies that have examined the ability of firms to time the debt markets (e.g. Baker et al. (2003), Faulkender (2005)). However, the underlying implications are not as straightforward as the conclusions seemingly indicate, while the evidence of managers' market timing shown in the empirical studies is mixed[38]. A very important reason for this is that, as suggested by Butler et al. (2006), some of these results are forward-looking, i.e. they involve decisions that are based on the prediction of future market variations, while others can be defined as backward-looking, which implies they are reactions to past and current market conditions. The mixture of these different definitions, to

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[38] The majority of supportive evidence comes from the identification of the relationship between the firm's debt issue decisions and debt market condition factors, such as term structure. Among others, these studies include Barclay and Smith (1995), Stohs and Mauer (1996), Guedes and Opler (1996), Datta et al (2000) and Baker et al. (2003). The studies are mostly based on the efficient market hypothesis, such as Schultz (2003), Butler et al. (2005, 2006) and Barry et al. (2006). Brown et al. (2003) and Adam and Fernando (2005) documented that managers' timing behaviour does not add value to firms, which directly implies unsuccessful timing.

a large extent, explains why there is an argument among the empirical studies about managerial market timing. Therefore, it is important to empirically clarify the different implications of the managers' ability to predict future variations in the market environment and their responses to changes in market conditions. Meanwhile, this notion bridges the gap between managerial timing behaviour and the coincidence of market information.

3.1.2. Forward-looking and backward-looking market timing

With the above in mind, this chapter examines managerial market timing and corporate debt issues from two aspects. It investigates whether managers adopt speculative strategies for their debt issue policies which involve betting under certain market conditions, or whether they simply respond to the variability of the current market conditions as compared to the past. In other words, does forward or backward-looking market timing dominate firms' debt issue decisions? Another question is to what extent does managerial market timing lead to persistent success in a variety of market environments? Clearly, there is a great deal of difference between trying to time the market and actually succeeding in doing so. If managers do not have informational advantages over other market participants, they cannot successfully lower the costs of capital simply by timing the market. Therefore, it is necessary to examine whether firms systematically outperform in timing the debt market, or are they are simply betting in a fair gamble.

Prior to investigating the above questions, the starting point is the argument concerning the empirical evidence presented by Baker, Greenwood and Wurgler (2003), which revealed a relationship between managerial decisions and market condition variables. Although most of the existing studies on market timing have examined equity issues, Baker et al. (2003) found evidence that managers time the debt's maturity. They found that, at the aggregate market level, the share of long-term debt is significantly driven by debt market condition factors including inflation, real short-term rates and term structure. Butler et al. (2006) argued that

these results are surprising because debt issuance is a two-sided proposition based on market-level information. It seems doubtful that managers possess an advantage over investors in fixed income securities regarding information on interest rate variability, as most of such investors are professional institutes such as banks, trust funds and insurance companies. Inspired by the notion of psuedo market timing in Schultz (2003), Butler et al. (2006) argued that there is a structural break during the sample period of Baker et al. (2003), although, in response, Baker et al. (2006) contended that the psuedo market timing bias has only a minimal influence on the ability of aggregate debt maturity structures to explain excess bond returns. Starting from this argument, the present chapter first examined the empirical works of Baker et al. (2003) using firm-level debt issue data rather than aggregate macroeconomic data. One important part of the evidence in Baker et al. (2003) is that the negative relationship between the long-term share of debt and the debt market variables implies that firms issue more long-term debt when the market suggests a low cost of raising debt. However, this contemporary relationship suggests only that firms are trying to time the debt market or are simply reacting to the variations of market conditions. An examination was made of the relationship between the corporate debt issues and the debt market condition factors with the additional controls of economic indicators and time trends. More importantly, the investigation of the contemporary relationship between debt maturity structure and debt market condition factors was extended to the lead-lag relationship. This method directly examined the debt maturities and proceeds with the lagged market condition variables to see whether the debt issues were coincident with the hypothesis of market timing. Put differently, this tells us whether the firms' decisions were made before or after the changes in the market environment.

Next, an investigation was made into the different forms of market timing, i.e. forward and backward-looking timing. As suggested by Graham and Harvey's survey, "managers attempt to time interest rates by issuing debt when they feel that market interest rates are particularly low" (p. 223). This finding could imply that

managers issue debt when current rates are relatively low compared to recent historical levels, or it could mean that managers attempt to issue debt when they believe that interest rates will rise in the future. Put differently, firms may be only responding to the debt market conditions or are successfully anticipating future interest rates in order to reduce the costs of capital. Therefore, this stage involved two separate investigations based on the different forms of debt timing implied in the surveys. Since both Baker et al. (2003) and Butler et al. (2006) employed annual macroeconomic data that does not permit the examination of bond characteristics, such as debt maturity, call and put features, and values of debt issued, the more detailed firm-level data used here will allow the disclosure of these factors that may be important in reflecting the underlying determinants of debt issuance. On the one hand, the levels of debt issuance across the different conditions of interest rates relative to their historical levels, i.e. backward-looking timing, were examined directly. A relatively low interest rate implies good timing in issuing a new debt unless managers believe the interest rates will tend to decline continuously in the future. The effects of the relative interest rate levels on the debt features such as maturity and embedded call and put options were also examined. In addition, the influences of economic growth and the equity market volatility were considered in the tests. On the other hand, an examination was made of the firms' ability to forecast future interest rates, i.e. forward timing. Provided that the firms had correctly anticipated the debt market variations, it would be expected that more debt would be issued before an interest rate increase and more long-term debt to be issued before a term spread increase. Therefore, the changes in interest rates and spreads were weighted by maturity and/or issue amounts. A significantly larger value-weighted interest rate change than average would suggest successful forward-looking timing of the debt market. Term spread, risk spread and excess bond returns were employed in the tests as alternative measures of the debt market conditions.

Finally, it is certain that firms will adjust the maturity structure of a debt to reduce

the costs of capital based on the market conditions. High excess bond returns imply that the outperformance of long-term bonds over the short-term debt and therefore the high costs of long-term debt issuers. If most of the managers correctly anticipated the variations in the debt market, it would be expected that more of the firms would shift their debt maturity structure from the long to the short-term (i.e. the percentage of long-term debt issuers would increase) followed by an increase of excess bond returns, and *vice versa*. Therefore, the annual portfolios of the net issuers of long and short-term debt were constructed based on the entire database of Compustat to demonstrate whether there were overall shifts between the long and short-term debt across the years corresponding to the variation in capital costs measured by the proxy of excess bond returns[39]. An examination was made of the percentage of firms that correctly made decisions regarding debt maturity choices by anticipating future bond returns in any given year. In addition, an investigation of the persistent ability of successful anticipation helps to judge whether the managers that made correct decisions were better able to systematically time the market than others, or had they simply and luckily guessed correctly?

3.1.3. Responses or predictions

In general, the main findings from the above empirical strategies are as follows. Firstly, qualitatively similar results were obtained when a re-examination was made of the contemporary relationship between the debt issues and the market condition variables. However, the negative relationship between the debt issues and the lagged debt market variables suggests that the firms' decisions concerning maturity choices and issue timings were not the right ones as regards successful market timing. These results suggest that the firms issued more debt and more long-term debt before the interest rates declined. Therefore, the market timing hypothesis holds as regards the relationship between debt issues and either

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[39] Excess bond returns comprehensively reflect the market expectations of the variation of interest rates. Baker et al. (2003) also used the excess bond returns as a proxy for the costs of debt issuance to measure the timing attempts of debt issuers. We calculated the excess bond returns using the annual returns of the corporate bond index over the returns of the 90-day Treasury bill.

contemporary or previous debt market condition variables, but fails to explain the correlation between debt issues and post-issue market variables. Secondly, when examining the firms' debt issuances based on two different directions of the market condition variables, no supportive evidence was found to show that the firms were successful in predicting the future debt markets. The changes in interest rate-related variables weighted by debt features, such as maturity, effective maturity and issue volume, after a debt issuance were not significantly larger than the average changes of these interest rate variables, which suggests there was no obvious increase in long-term debt issues before the interest rates rise. However, it was found that more debt was issued when the current interest rate levels were relatively low compared to the historical levels. The numbers and volumes of issues declined as the percentile of the current interest rates in the recent levels had risen, even where the different states of the equity market and economic growth were controlled. This result is consistent with the preceding findings as well as the implications in the survey studies regarding backward market timing. Thirdly, it was found that firms cannot correctly predict future interest rates for their debt issue decisions systematically and persistently. No shifts of firms from long to short-term debt were found no matter whether the excess bond returns in the following year had risen or declined. In general, the net long-term debt issuers and the net short-term debt issuers were roughly equal across the high and the low return years. Moreover, those firms that made correct choices of debt maturity structure showed no persistent ability in the following years. In summary, the above results all imply that managers do not have informational advantages as regards the debt market. As a result, their efforts to time the future market when issuing debt is not generally successful, while the evidence suggests they simply respond to the market variations.

This chapter extends the literature on debt issue market timing in several ways. Based on the recent hot debate regarding debt market timing for corporate debt issues, this chapter uses the direct time-variant method to identify the

cause-effective relationship between debt issues and market variations. It examines whether firms successfully time the market when deciding on debt maturity structure with identification of the market timing definition. Distinguishing forward and backward timing reveals whether managers possess informational advantages as regards timing the market. The evidence suggests that the firms were passively responding to past fluctuations in market conditions rather than successfully predicting the future variations of the debt market. This notion explains the mixed and plausible evidence in the debt market timing literature, and bridges the gap between the market timing hypothesis and the efficient market hypothesis. In addition, apart from the aggregate macroeconomic data, a very large firm-level sample consisting of more than 17,000 new corporate public debt issues covering the period from 1970 to 2006 offers a convincing basis from which to comprehensively examine debt market timing while accounting for important bond features and firm-specific financial characteristics.

The remainder of this chapter is organized as follows. Section 3.2 reviews the previous literature on market timing and debt issuance, especially the recent hot debates regarding whether firms successfully time the market. Section 3.3 describes the data and the characteristics of the samples involved in this study. In section 3.4, the empirical investigations in Baker et al. (2003) are extended to examine the potential argument concerning managerial debt market timing. Section 3.5 examines the different forms of market timing, i.e. forward-looking and backward-looking, followed in section 3.6 by an investigation of firms' persistent ability to time the market. Section 3.7 provides conclusions.

3.2. Market timing and corporate debt issuance: overview of the literature

The question as to whether corporate managers can *successfully* time the debt market when issuing debt is a crucial issue in the ongoing debate between the efficient market hypothesis and behavioural finance. If corporate managers could make use of the arbitrary opportunities of asset mispricing to lower the costs of capital when raising funds, it may prove that the market fails to incorporate the information communicated by security issuances. However, although much of the literature has examined this issue both theoretically and empirically, the market timing hypothesis has continued to be an important topic of debate. This section reviews the literature regarding market timing in security issuance, starting with market timing and debt-equity choice. The second part focuses on debt market timing and the third part reviews the recent argument about the existing evidence that shows there to be a contemporary relationship between security issues and capital market returns. This is followed by a new explanation of market timing and corresponding evidence is presented regarding whether firms successfully time the market when making their security issuances. Finally, this section finishes with a brief summary.

3.2.1. Market timing and debt-equity choices

Modigliani and Miller (1958) indicated that, if the costs of different forms of capital do not vary independently in an efficient and integrated capital market, there is no gain to be had from switching between equity and debt. This raises the question as to why some firms raise new funds by issuing equity while others issue debt. Traditional capital structure theory has failed to give a universal answer to this question of firms' debt-equity choices. In general, there are two important explanations in the literature: (1) the *trade-off* theory[40], which states that firms set targets of debt levels that balance the tax advantages of additional debt against the costs of possible financial distress, and (2) the *pecking order* theory[41], which states that firms will borrow, rather than issuing equity when internal cash flows are not sufficient to fund capital expenditures. Recently, the *market timing* hypothesis has

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[40] See Bradley, Jarrell and Kim (1984), Long and Malitz (1985), and Titman and Wessels (1988).

[41] Initialized by Donaldson (1961), there are several non-tax reasons explaining the pecking order theory of financing choices from management incentives, information asymmetry and stakeholder interests, see Miller (1977), Zweibel (1996), Myers and Majluf (1984).

arisen in a number of theoretical and empirical research papers examining debt versus equity choices. It explains that corporate managers have the incentive to make decisions on the debt-equity choice to lower the cost of capital and thus benefit existing shareholders according to the historical, current and expected future market conditions at the time of security issuances, with the assumption that they believe it is possible to capture the market imperfections.

In 1977, Taggart examined debt-equity choices and their relationship with target capital structures and debt capacity. He suggested that timing considerations might affect firms' capital structures but that this needed to be further examined. By examining corporate debt issues in the UK in the period 1959 - 1974, Marsh (1982) found evidence of firms choosing debt and equity according to the market conditions and recent security prices. He argued that managers are clearly "timing" the market at the time they issue securities. In recent years, a number of empirical and survey studies have found considerable evidence that supports the market timing theory in corporate security issues. Hovakimian, Opler and Titman (2001) found a strong relationship between stock prices and seasoned equity issuances. The hypothesis of their study regarding firms' debt-equity choices is based on the existence of a target leverage ratio, whereas, in the empirical tests, they found that the target ratio changed over time as the firms' stock prices changed. In another relevant study, Kaplin and Levy (2001) comprehensively examined corporate security issues, including both stocks and debt, and revealed that the ratio of aggregate short-term to aggregate long-term debt issues is highly correlated to macroeconomic conditions. This finding implies that firms' financing decisions are driven heavily by the market conditions. Baker and Wurgler (2002) explained the market timing theory by showing that capital structure is the cumulative outcome of past attempts to time the equity market. Empirical evidence was directly identified in the survey study by Graham and Harvey (2001), who investigated the CFOs of public corporations anonymously and revealed that two-thirds of the respondents stated that when issuing equity "the amount by which our stock is undervalued or overvalued was an important or very important consideration" (p.216). Therefore, the evidence implies that firms' financing decisions may not be solely driven by firm-specific financial characteristics but also be related to market conditions.

The "new issues puzzle[42]", which reveals the phenomenon of the long-run post-issue underperformance of equity issuances, should not be ignored. This phenomenon is closely associated with equity market timing, which refers to the practice of issuing equity at high prices and repurchasing at low prices. Ritter (1991) showed initial public offerings' (IPOs) underperformance relative to indices and the matching stocks in the three to five years after going public. One reason for this post-issuance long-run underperformance is associated with high volume periods, which suggests that issuers successfully take advantage of "windows of opportunity" when timing new issues at high prices. Loughran and Ritter (1995) found that seasoned equity offerings (SEOs) have a similar pattern of long-run underperformance as IPOs. However, they failed to find a reasonable explanation based on the traditional risk-return framework, and therefore left a puzzle[43]. At the aggregate level, Baker and Wurgler (2000) found a negative relationship between the equity share of the total security issuance and the average value-weighted market returns of the following year. Accordingly, equity issuance relative to total equity and debt issuance (equity share) predicts aggregate market returns. They argued that the market timing hypothesis, discussed as a behavioural element in these studies, provides a potential explanation for the "new issues puzzle". Baker and Wurgler (2002) explained the simple theoretical framework of market timing as that managers may reduce the overall cost of capital paid by their ongoing investors by issuing overpriced securities and re-purchasing under-priced securities. Although they indicated that the aggregate predictability results should probably not be interpreted as evidence that "managers can time the aggregate market", they argued that the average financing decision will contain information about the average mispricing, even if individual managers are responding only to their own firm's mispricing. In summary, "when viewed as a whole, the evidence indicates that market timing plays a nontrivial role in firms' choices of security issuance" (Baker et al. (2004), p23).

However, the market timing theory is still arguable when considering both the

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[42] Loughran and Ritter (1995) examined initial public offerings (IPOs) and seasoned equity offerings (SEOs) during the period of 1970 to 1990. They find that, although the systematic risk measure, β, was slightly higher for issuing firms than non-issuers, firms issuing equity produced such low returns over the following five years. This is referred to as "the new issues puzzle".

[43] However, among others, Brav, Geczy and Gomper (2000), Mitchell and Stafford (2000) and Gompers and Lerner (2003), found weak or no evidence for the "new issues puzzle".

empirical and theoretical studies. The above evidence shows only one side of the coin. Although there is evidence that stocks performing in either IPOs or seasoned SEOs generate low returns during the period of two to five years following the issue date, which challenges the efficient market hypothesis and motivates the development of behavioural corporate finance. Advocates of the efficient market hypothesis argue that the reason for the existence of the seasoned stock issuance and the low returns following IPOs and SEOs is that they are actually less risky rather than the mispricing of securities utilized by corporate managers with informational advantages or "sharp insight". For example, Eckbo, Masulis and Norli (2000) presented evidence from a large sample to show that the low post-issue returns pattern is subject to small growth stocks. Therefore, this "new issue puzzle" can be explained using the appropriate technique with a proper control for risk. They explained that, as equity issuers reduce the leverage ratio, their exposure to unexpected inflation and default risks decreases, thus decreasing their stock's expected returns relative to non-issuers. Eckbo and Norli, (2005) provided further evidence based on a risk-return framework to argue that abnormal returns, as the evidence of managers' market timing in equity issuance, are indeed a result of asset pricing model misspecification. Jung, Kim and Stulz (1996) indicated that a theory of corporate security choice should answer the following three issues. Firstly, there is the question of why firms choose to issue a particular security. Secondly, how the market reacts to that choice and thirdly, what actions the firm takes after the issue. They investigated the ability of the pecking-order model, the agency model and the timing model to explain firms' decisions regarding whether to issue debt or equity, the stock price reaction to their decisions, and their actions afterward. They found support for the agency model and the pecking-order model but not the timing model. They concluded that market timing theory relies on the assumption that the market fails to incorporate all the information communicated by a security issue. As a matter of fact, this argument has not yet been theoretically explained by the market timing hypothesis. This brings us on to the underlying debate about the efficient market hypothesis and behavioural finance.

3.2.2. Market timing and debt issuance

Needless to say, firms issue debt in order to raise capital. Many factors affect the decisions of companies to issue new debt and the features they select for the debt. Debt maturity choice has been an important factor noted in the literature. Brick and Ravid (1985) found that a decreasing term structure of interest rates renders short-term debt optimal due to the tax reason. In similar situations, an increasing term structure results in long-term debt being optimal. Barclay and Smith (1995) and Stohs and Mauer (1996) documented a similar relationship in that the maturity of a debt is negatively related to the term spread at the level of aggregate balance sheet data. Guedes and Opler (1996) examined debt maturity decisions using a sample of over 7,000 debt issues. They observed that higher quality firms tend to borrow at both ends of the maturity spectrum, while lower quality firms tend to borrow at middle maturities. However, they did not find that a firm's debt maturity choice is related to the firm's future equity market performance. Very importantly, they also found that debt maturity tends to be shorter when the term premium is higher, and similarly to the argument in Marsh (1982), they argued that such choices are inconsistent with an expectations theory of the term structure. These studies found a relationship between debt maturity and the term spread of interest rates. However, they did not address their findings to managers' attempts to time the markets.

Recent empirical studies have begun to connect debt maturity choices to debt market timing. For example, Datta, Iskandar-Datta and Raman (2000) revealed that bond IPOs in the US have similar patterns of underperformance over the three and five-year post-offer periods. They found evidence that debt IPOs are timed to coincide with the market having the highest expectations concerning the firm's prospects. Moreover, the post-offer underperformance of debt IPOs is more pronounced for the longer maturity issues. Baker, Greenwood and Wurgler (2003) documented that, in the aggregate, managers are able to engage in the successful timing of fluctuations in the yield curve by the judicious choice of maturity structure for their firm's debt. Specifically, they found a negative correlation between future excess long-term bond returns and the ratio of long-term debt issues to total debt. This is explained as evidence of successful debt market timing

because it seems that managers tend to issue more long-term debt relative to short-term debt based on their prediction of the low excess returns of long-term debt in the future. The choices of debt yield types have also been documented in a number of studies. Faulkender (2005) examined whether firms were hedging or timing the market when selecting the interest rate exposure of their new debt issuances. In this study, Faulkender employed the measure of interest rate exposure by combining the initial exposure of newly issued debt with their use of interest rate swaps. He found that the final interest rate exposure was heavily driven by the slope of the yield curve at the time the debt was issued. This suggests that firms are motivated by market timing when choosing the yield types of debt issuances. Debt market timing and equity market timing differ in important respects. Most notably, equity market timing is typically connected to inside information, while debt market timing can only be driven by publicly available information. In other words, no firm has inside information about future interest rates.[44] Corporate managers could issue overvalued stocks and repurchase undervalued stocks because they have the advantage of internal information about the value of the firms' equity over outside investors. This can be explained by saying that managers are better informed about the idiosyncratic component of their own firms' stocks than outside investors. However, it is hard to explain why corporate managers should also possess informational advantages at the market level. If mispricing of the stock market and the informational advantage of corporate managers can explain equity market timing, it is another story for market timing in corporate debt issuance. In contrast to stock prices, the value changes of outstanding corporate debt depend solely on the term structure of the interest rates rather than the firms' operating or financial dimensions. As a fixed-income security, debt is seldom incorrectly priced. Therefore, it is odd to imagine that the purchasers of corporate debt, most of whom are professional investors, would make irrational decisions. In this setting, debt market timing *per se* is not possible.

Theoretical explanations of debt market timing follow two lines. On the one hand, debt market timing is related to stock market performance. Equity overvaluation

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[44] In an asymmetric information framework, where firm insiders are better informed than outside investors, Flannery (1986) and Kale and Noe (1990) showed that long-term debt can potentially be more mispriced than short-term debt. Thus, firms with favourable private information issue short-term debt to reduce borrowing costs when favourable information materializes. By contrast, long-term debt will convey bad news to the market and outside investors, and extra issuing costs will have to be afforded.

releases and creates extra capability of debt. As a result, debt issuance is followed by low stock returns. Antoniou et al. (2006) examined the determinants of debt maturity structure in the UK, Germany and France. Apart from the firm-specific factors[45], their results revealed that the impacts of market-specific factors, such as the market equity premium, term structure, share price performance and interest rate volatility, on debt maturity decisions are relevant in the UK. Very importantly, the evidence shows that changes in stock prices have a positive relationship with debt maturity. This positive relationship suggests that firms issue informationally disadvantaged security (e.g. long-term debt) after a rise in their share prices. In addition, as mentioned in the preceding section, Hovakimian, Opler and Titman (2001) examined firms' debt-equity choices based on the hypothesis of a target leverage ratio. In their empirical tests, they found that the target ratio changed over time as the firm's stock prices changed. This hypothesis indirectly explains how debt market timing is affected by the exogenous factors of stock markets.

On the other hand, the endogenous reason for debt market timing may be interpreted as the irrationality of corporate managers. Ignoring rational moral hazard behaviour, the concern here is with the situation where managers believe they have a superior ability to maximize shareholders' value. However, the evidence does not support the existence of this ability. Butler et al. (2006) found that firms as a whole cannot adjust their debt maturity structure as a capital costs measure by excess bond returns, although the difference between the high return years and the low return years are significant. Moreover, even the firms that seem to succeed in timing the market do not exhibit a persistent ability in the following years. Brown et al. (2006) examined the gold mining industry in the North America regarding the influence of managers' market views on hedging. Firstly, they found that many firms actively adjusted their derivatives based on their view of the market. They found some evidence of firms successfully timing subsequent changes in gold prices. However, they found no evidence that the managers' timing of the market led to superior performance in a variety of operating or financial dimensions. Another relevant study by Adam and Fernando (2006) also documented the North America gold mining firms' market timing in using

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[45] These factors included firm size, market-to-book ratio, asset maturity, earning volatility, tax rates and liquidity.

derivatives or selective hedging strategies. Focusing on the hedging programmes of derivative usage based on the managers' view of the market, they found considerable excess volatility in the hedging ratios over time. They referred to market timing behaviour as a type of managerial speculation. Consistent with Brown et al. (2006), they concluded that the cash flow gains from managers timing the market were "small at best". Thus, evidence shows that firms can not realize economically significant benefits by trying to time the market. Therefore, managers do not show a significant informational advantage concerning the market volatility, and their market views fail to translate to shareholders' values. In this case, managerial market timing may actually destroy firm value, as indicated in Stulz (1996).

No matter which explanation is followed, the empirical studies seem to point to the existence of debt market timing. Questions that need further consideration are how the market reacts to managerial market timing on choices of debt features, and the consequences of firms' timing strategies.

3.2.3. Genuine market timing versus pseudo market timing

There is hot debate in the recent literature about whether corporate managers accurately time the market when they issue new securities. Baker and Wurgler (2000) and Baker, Greenwood and Wurgler (2003) examined the issuance of equity and corporate debt maturity respectively and revealed evidence that managers can successfully time capital markets. In the equity market, the share of equity in total issues was strongly negatively correlated to future aggregate equity market returns. Moreover, this share increased immediately after a year of high equity market returns and just before years of low market returns. In the debt market, inflation, the real short-term interest rate and the term structure predict excess bond returns, while the long-term share in the aggregate total debt issues is negative to each of these market condition variables. As a result, the share of the long-term debt in total debt issues is negatively correlated with future aggregate excess bond returns. This evidence is interpreted as successful debt market timing because managers tend to issue more long-term debt relative to short-term debt when they believe the

future excess long-term bond returns will decline[46]. The reason that these findings are crucial is because they imply that markets are unable to allocate capital efficiently at the aggregate level. Baker et al. (2000) considered three explanations for market efficiency but found no support for any of them. They claimed that managerial timing of an inefficient market is the most credible explanation of the results.

With a suspicion of the above evidence, Schultz (2003) raised a pseudo market timing hypothesis suggesting that, even though the market is efficient and managers had no superior timing ability, there could be the probability of observing long-run underperformance *ex post*. Since managers tend to issue equity when their stock prices have increased and issue debt when the interest rates have declined, the evidence of seeming managerial market timing is indeed the result of a spurious *ex post* relationship between security issuance and market returns. The implication of the notion of pseudo market timing is that the benefits received by the equity issuers at market peaks trigger further equity issuances. Accordingly, the more firms benefit from their security issues, the more likely they are to issue them. These peaks are observed *ex post*, but are not predictable *ex ante* if markets are efficient. Pseudo market timing also explains the poor long-run performance following debt issues. So, it is surprising that managers issue debt instead, if they can time the market and issue stock when it is overpriced. Another important implication of the pseudo market timing explanation of the mixed evidence concerning market timing is the time measure. It demonstrates that if markets are *ex ante* efficient, abnormal returns are observed *ex post* in event time rather than calendar time. When returns are measured in calendar time, each month is weighted equally, in event time each issue is weighted equally. Some studies have found clues from the different time measures. For example, Loughran and Ritter (1995, 2000) observed that excess returns following equity offerings were much lower when measured in event time than in calendar time. Gompers and Lerner (2003) determined that throughout the period 1935 - 1972, buy-and-hold abnormal returns were negative in event time following IPOs, but disappeared when calculated in calendar time. Therefore, weighting each month rather than each

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[46] They admitted that the favourite explanation is that managers are *trying* to time the debt market because it is hard to determine whether managers are reducing the overall cost of capital (p.263).

offering equally will understate the abnormal returns. Pseudo market timing only predicts that equity issuers will underperform in event time rather than in calendar time. Therefore, an easy way to avoid this problem is to use calendar time returns rather than event time returns. However, few studies have hitherto examined this effect on debt issues. In short, the pseudo market timing suggests that the evidence of long-term post-offering underperformance can be measured *ex post* but is not predictable *ex ante* in an efficient market.

Following the conclusions of Baker et al. (2000, 2003), Butler et al. (2005, 2006) proposed an efficient market explanation for market timing for equity and debt maturity respectively based on the pseudo market timing documented by Schultz (2003). They argued that structural breaks or "regime shifts" create the "seeming" evidence of successful market timing. They suggested that aggregate pseudo market timing is more likely to occur around unexpected large market shocks. The evidence from the equity market shows that the negative relationship between the equity share and future market returns, which is regarded as the evidence for managerial market timing, only appears surrounding the two identified structural breaks. Excluding these events causes the in-sample predictive ability of equity share to vanish. As regards the debt market, Butler et al. (2006) also identified that the existence of interest rate structural breaks during the sample period in Baker et al. (2003) caused a spurious correlation between the fraction of long-term debt in the total debt issues and future excess bond returns[47]. On removal of the impact of these structural breaks, the predicting power of debt maturity on excess bond returns disappears.

Genuine market timing suggests the tendency of firms to issue security before low excess returns. By contrast, pseudo market timing implies the tendency of firms to issue security following high returns. This seems to be simply a technical question of time-series econometrics. However, in the setting of financial theory, the central issue is whether there exist predictable arbitrary opportunities. In other words, if it may be the case that in the equity market managers are able to time their equity issues to exploit not only the idiosyncratic component of their firms' returns but

[47] Although Baker et al (2006) admitted the existence of a single structural shift in the time series of excess returns in the early 1980s, they claimed that the "pseudo market timing bias" is simply a different name for the small sample bias known to affect predictive regressions and is ignorable with the prior inferences about the ability of equity share and aggregate debt maturity structure to explain returns.

also the market component. In the debt market, corporate managers choose the maturity for new debt issues according to the debt market condition factors. It is unclear how corporate managers could possess informational advantages over the rest of the market participants, which would allow them to achieve such success in timing their security issuances, while other professional investors are unable to have a similar capability of beating the market[48], especially for debt issuance. Butler et al. (2006) examined the persistent performance of managers who appear to have correctly timed the market, but found no evidence to suggest that these managers have a persistent ability to forecast future market returns. Therefore, they argued that even if corporate managers seem to successfully time the market, it is just because they have been fortunate in guessing correctly. However, their attempts to time the market cannot result in any systematic success.

The argument between genuine market timing and pseudo market timing can be explained as being that of whether there is an ability to actively predict the market or there are simply passive reactions to market variations. Based on the historical market information, firm managers make financing decisions corresponding to their prediction of future changes in the market environment. Barry et al (2005), therefore, first distinguished mark et timing as two types: forward-looking and backward-looking timing, to examine an alternative explanation for the mixture of evidence regarding corporate debt issue market timing. Forward timing suggests that managers implement timing strategies based on their prediction of future market movements, for instance, they issue more long-term debt if they expect the future interest rates to go up. While backward timing implies a passive response to past market variations, for example, managers issue more debt when the current interest rates are low relative to the historic level. Consistent with other survey studies, they found strong evidence of backward debt timing. However, they found no evidence that firm managers are successful in forward timing. On the one hand, this interprets the existing empirical evidence of contemporary movements of debt issues and debt market conditions. On the other hand, it supports the assumption that the market is efficient and that managers do not exhibit superior ability in predicting future market returns. Therefore, the evidence suggests that market

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[48] Evidence suggests that even professional money managers are not able to consistently beat the market, e.g. Gruber (1996).

timing is indeed the corresponding reactions of managers to the changes in market conditions.

3.2.4. Summary

In summary, firms' debt-equity choices and capital structure theory have always been important issues in the field of financial economics. The market timing hypothesis provides a potential explanation involving the behavioural factor, but the empirical evidence is still mixed and arguable and the conclusions inconsistent. Underlying this debate is the regime of the efficient market hypothesis and behavioural finance. The gaps in the literature regarding debt market timing can be seen in several aspects. Firstly, in contrast to the literature on equity financing patterns, but related to the actual importance of debt financing, "the literature on debt financing patterns is surprisingly underdeveloped" (Baker et al. (2003), p.262). Secondly, most of the empirical evidence regarding debt market timing comes from the co-variation of the corporate debt issuance and debt market condition factors (see section 2.2), while it is plausible that the evidence can identify whether managers successfully time the debt market, as shown in the recent argument about "genuine" or "pseudo" market timing (see details in section 2.3). In addition, whether firm managers possess superior abilities as regards timing the debt market when deciding their financing strategies remains open to question. In contrast to the equity market, the capital costs of debt issues depend more heavily on the public market information. Therefore, it is harder to capture the arbitrage opportunities in the debt market, while the determinants of firms' debt market timings are not clear. This chapter engages in bridging these gaps.

3.3. Data and sample characteristics

3.3.1. Data and sources

This chapter examines corporate debt issues concerning market timing in the US market. The data for new and non-convertible public corporate debt issues was obtained from the Thompson Financial SDC bond database covering the sample period January 1970 - March 2005. Data was obtained on the issue date, the identity and characteristics of the borrowers, and various characteristics of the bond issuances, such as proceeds in nominal dollars, maturity, yield to maturity at issuance, credit rating, yield types (fixed or floating rate), and embedded options such as callable or puttable[49]. The proceeds measured by constant dollars of March 2005 [50] we re calculated by the nominal proceeds adjusted by the monthly consumer price index (CPI) to eliminate the influence of inflation and economic growth in the long horizon of 37 years. The sample set excluded issues by non-US firms, issues outside of the US, issues by financial firms (with SIC codes 6000-6999) and issues by non-profit organizations, such as the education sector and public medical service. These screens reduced the number of available issues to 17,404 from 3,040 firms.

In contrast to commercial papers or other short-term bank loans, which are mainly used to temporarily adjust internal cash flows, the debt issues examined in this chapter were corporate bonds issued in the public debt markets which are heavily influenced by the assets allocation of the market mechanism and therefore have less informational asymmetry. Moreover, the long-term public bonds are usually large in issue values and have long maturities. Compared to the variability of commercial papers or other short-term debt, long-term debt require longer leading times for preparation of the issuance and more cautious considerations. Therefore,

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[49] Thompson Financial SDC New Issues database does not introduce the callable and puttable data of corporate bonds before 1976. Therefore, all calculations involving these embedded options only cover the period starting from 1976.

[50] This date was chosen because the debt issuance sample actually ends in this month due to 2-year forward-looking in the empirical tests and the data availability till March 2007.

the specific features of long-term bonds such as timing, maturity, issue volumes and yield types reflect not only managerial concerns regarding the effects of the debt issues on the firms' financial characteristics but also the estimation of future market variations. For example, provided that managers believe that the market interest rates or term spreads will rise, they will be more likely to "lock in" the current lower rates or spreads by issuing long-term bonds rather than short-term bank debt. Thus, the sample of publicly issued bonds should be especially useful for examining whether the issuance decisions of corporate managers reflects their confidence in timing the debt markets.

Screened by the availability of data regarding the debt issuers' financial characteristics in COMPUSTAT, 13,340 observations (out of the initial 17,404 issues available in the SDC) were obtained from 2,029 debt issuers finally. The annual variations in the issuers' short-term debt and the levels of long-term debt were collected to measure the firms' capital structure choices. Meanwhile, the data regarding financial characteristics of the debt issuers, including market values, P/E ratios, market-to-book value ratios, leverage ratios, free cash flows and capital expenditures was also collected.

In addition to the data on new debt issues, the debt market data, such as interest rates and inflation rates, was also collected. The time series of the monthly yields on Treasury bonds and corporate bonds with various maturities and inflation rates (measured using the Consumer Price Index) from the Saint Louis' FRED database of the Federal Reserve Bank were obtained. The interest rates included the 90-day Treasury bill rates ($T90_t$), the ten-year constant maturity Treasury rates ($G10_t$) and the Moody's Seasoned Baa Corporate Bond Yield (Baa_t)[51]. The ten-year constant maturity Treasury rates and the 90-day Treasury bill rates were employed as proxies for the long-term interest rates and short-term interest rates respectively, and then the term spread ($G10_t$-$T90_t$) was measured as the difference between the

[51] The Moody's Seasoned Baa Corporate Bond Yields were employed as the proxy for the commercial interest rates. The Moody's Seasoned Aaa Corporate Bond Yields were also collected and used for robustness checks.

ten-year constant maturity Treasury rate and the three-month Treasury bill rate. The risk spread (Baa_t-$G10_t$) was measured as the difference between the Moody's Seasoned Baa rates and the ten-year constant maturity Treasury bond rates. The annualised inflation rates were measured in percentage terms for each monthly observation. The real short-term rates ($T90_t$-Inf_t) were estimated as the annualised 90-day Treasury bill rates minus the actual inflation rates.

The series of monthly bond index returns were generated from the Morningstar SBBI Classic Yearbook 2006[52]. The index includes nearly all Aaa- and Aa-rated corporate bonds. The excess government bond returns were measured by the index of Treasury bonds over bills and the excess corporate bond returns were measured by the index of investment-grade corporate bonds over the index of Treasury bills. The annual excess corporate and government bond returns were measured as the compounded monthly return on the long-term corporate (government) bond index over 12 months divided by the compounded monthly return on the T-bill over 12 months, minus one. The annualised three-year cumulative excess returns were measured as the third root of the compounded monthly returns on the T-bills over 36 months, minus one.

Finally, to investigate the underlying relationship between the debt market and stock market, data that characterizes the stock market, including the price-earning ratio and market-to-book value ratios of the S&P 500 index during the corresponding period, was also collected from the CRSP and COMPUSTAT. Moreover, the US Coincident Index (USCI)[53] from the Economic Cycle Research Institute (ECRI) was introduced as the proxy for the business cycle indicator to

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[52] The former Ibbotson Associates was combined with the Morningstar Inc. in 2006. As described in the Yearbook, the total returns on long-term government bonds are constructed with data from The Wall Street Journal. To the greatest degree possible, a bond portfolio with a term of approximately 20 years and a reasonable current coupon was used in each year. The bond was "held" for the calendar year and returns were computed. The Corporate bond portfolio is presented by the Citigroup Long-term High-grade Corporate Bond Index (formerly Salomon Brothers). Before 1968, the total bond returns were calculated by summing the capital appreciation returns and the income returns.

[53] It is a comprehensive summary measure of US economic conditions made up of coincident indicators of the US economy including measures of production, employment, income and sales, produced by the Economic Cycle Research Institute. Website: www.businesscycle.com

track the growth and variation in the US economy during the sample period.

The firm-level debt issue sample set has more strength than the macroeconomic data used in some studies, e.g. Baker et al. (2003) and Butler et al. (2006). Firstly, it involves detailed information regarding maturity. As it is reasonable to ask whether a long-term debt is of five-year or 30-year maturity, this dataset is helpful when examining the variations of debt maturity quantitatively. Secondly, the data provides information regarding the call options and put options embedded in the debt issuances. These embedded options reduce the effective maturity of an issue and change the cost characteristics accordingly. Moreover, the proportion of call or put usage varies across different maturities and over time. As will be discussed in the analysis, ignorance of this feature may cause results to be unconvincing. Thirdly, the firm-level data gives equal weight to each individual debt issue to make it easier to examine the preferences and cross-sectional variations of the managers' decisions on debt issues than with the aggregate macroeconomic data. Although the data has limitations of its own in that it cannot be guaranteed that the database covers all debt issues with no omissions, especially in the early period, it succeeds in addressing the major limitations of other datasets.

3.3.2. Sample description

Table 3.1 shows the description of the above corporate debt issuance data by year. Two measures of issuance activity were examined: the dollars of debt issues in the constant March 2005 dollars, and the deal numbers of issues. The results obtained for dollar amounts issued were qualitatively identical to those obtained for the number of issues. Therefore only the former is reported. The total amount issued in the sample was $3.57 trillion in the constant dollar of March 2005. The largest three debt issue volumes in a single year were 212 billion in 1993, 190 billion in 1998, and 172 billion in 1986. Figure 3.1 provides a straightforward overview of the relationship between the interest rates and issue volumes based on the monthly data. It shows graphically the general tendency for the debt issuances to follow the

rate declines. It can be seen that there was a tendency for the debt issuances to be higher in times of low rates. It can also be seen that all three peaks of debt issuance measured by both issue number and issue dollars during the sample period very obviously happened at neaps of interest rates compared to the preceding levels. Conversely, the smallest issue volumes occurred in 1982 and 1983 following the highest levels of Baa rates and GS10 in 1982 and T90 in 1981. This corresponds with the structural change in the early 1980s identified by Butler et al. (2006). Meanwhile, Figure 3.1 shows that the debt issue waves graphically followed the term-spread variability. The implicit correlation is empirically examined in subsequent sections.

Table 3.1 also shows the maturity and other characteristics of the debt issues on an annual basis and provides the annual average (median) 90-day and ten-year Treasury yields in the US. The annual average maturity was 16.16 years and the median of the sample was 13.76 years. A noticeable trend toward shorter maturities was found across the sample. For the period 1970-1983, it was very common for the average maturity to exceed 18 years. After 1983 when the interest rates reached the historical peak of the sample period, the average maturities apparently fell. The median maturity exhibited a similar pattern. After 1986, the median maturity was about ten years during each year except for the period 1999 - 2000, when it fell sharply. The effective maturity, which was measured by the time horizon from the issue date to the earliest callable (puttable) date, exhibited a different pattern. Table 3.1 shows the percentage of callable issues (available from 1976) over the total issues. The longer the initial maturity of the issue was, the more likely the issuers were to adapt the embedded callable. In the overall sample, about one quarter of the issues were callable, while about 3% of the issues included put provisions. Before 1993, for almost all years the percentage of callables was more than 30% (the highest was 60.9% in 1990), while after 1993, the percentages fell sharply and varied at around 15%. After adjusting for the embedded options, the effective maturity with a mean of 11 years and median of 8.77 years showed no obvious

trend of falling or rising over the whole sample period.

Table 3.2 exhibits the basic data statistics in Panel A and the correlations of the debt issue characteristics with the interest rates and spreads in Panel B, based on the monthly data. It can be seen that the monthly issue numbers and issue amounts were negatively correlated to the interest rates but positively correlated to the term spreads and risk spreads. Conversely, both the median maturity and effective maturity were positively correlated to the interest rates but negatively correlated to the term spreads. It can also be seen that there was a pronounced tendency for firms to adjust the stated maturity of their debt with the usage of call or put provisions during the high interest rate periods, as implied by the high correlations between the interest rates and percentages of callable and puttable options over the total issues.

Table 3.1 Sample Annual Distribution

Year	Issue numbers	Proceeds (2005-3 based)	Years to Final Maturity		Effective maturity		Fraction of puttable	Fraction of Callable	BAA		G10		T90		Term spread	Risk spread	Inflation
			Mean	Median	Mean	Median			Mean	Median	Mean	Median	Mean	Median			
1970	416	99,494.47	21.53	25.36	NA	NA	0.000	0.000	9.11	(9.19)	7.35	(7.39)	6.39	(6.48)	0.96	1.76	5.28
1971	386	87,112.49	24.16	25.37	NA	NA	0.000	0.005	8.56	(8.54)	6.16	(6.13)	4.33	(4.33)	1.83	2.40	3.26
1972	273	53,258.57	24.53	25.37	NA	NA	0.000	0.000	8.16	(8.22)	6.21	(6.16)	4.07	(3.95)	2.14	1.95	3.64
1973	188	43,368.08	25.60	30.44	NA	NA	0.000	0.000	8.24	(8.19)	6.84	(6.77)	7.03	(7.21)	-0.19	1.40	9.60
1974	297	84,407.15	20.76	25.36	NA	NA	0.000	0.000	9.50	(9.38)	7.56	(7.56)	7.83	(7.84)	-0.27	1.94	11.75
1975	409	102,209.09	18.88	16.23	NA	NA	0.002	0.029	10.61	(10.60)	7.99	(8.06)	5.78	(5.56)	2.21	2.62	6.69
1976	293	66,878.76	22.30	25.36	13.70	10.14	0.000	0.437	9.75	(9.84)	7.61	(7.74)	4.97	(4.96)	2.64	2.14	5.20
1977	276	52,514.00	21.85	20.70	12.26	10.02	0.004	0.431	8.97	(8.97)	7.42	(7.40)	5.27	(5.11)	2.15	1.55	6.81
1978	219	37,613.79	23.05	20.61	14.54	14.21	0.009	0.402	9.49	(9.49)	8.41	(8.42)	7.19	(6.87)	1.22	1.08	9.25
1979	209	44,847.46	21.62	20.29	15.40	13.68	0.024	0.349	10.69	(10.37)	9.44	(9.15)	10.07	(9.50)	-0.63	1.25	13.87
1980	323	64,742.85	18.85	15.22	13.53	10.02	0.006	0.381	13.67	(13.64)	11.46	(11.49)	11.43	(11.81)	0.03	2.21	11.79
1981	279	51,347.16	16.35	10.19	12.85	10.12	0.011	0.287	16.04	(16.06)	13.91	(13.70)	14.03	(14.72)	-0.11	2.13	8.26
1982	306	49,008.24	15.86	12.14	11.62	10.12	0.052	0.304	16.11	(16.71)	13.00	(13.74)	10.61	(11.72)	2.39	3.11	3.71
1983	262	40,748.98	18.31	15.22	12.86	10.15	0.069	0.344	13.55	(13.58)	11.11	(11.12)	8.61	(8.70)	2.49	2.45	4.29
1984	246	53,414.39	13.94	10.17	10.25	10.00	0.093	0.358	14.19	(14.15)	12.44	(12.42)	9.52	(9.72)	2.92	1.75	3.53
1985	414	79,762.93	15.97	10.18	11.51	9.99	0.046	0.399	12.72	(12.49)	10.62	(10.35)	7.48	(7.20)	3.14	2.09	3.97
1986	734	172,744.58	17.55	12.16	9.81	7.02	0.040	0.527	10.39	(10.22)	7.68	(7.44)	5.98	(5.95)	1.70	2.71	1.36
1987	469	107,454.06	15.09	10.17	9.20	7.02	0.049	0.463	10.58	(10.57)	8.38	(8.53)	5.78	(5.68)	2.61	2.19	4.13
1988	367	90,627.68	13.92	10.16	8.77	7.00	0.057	0.510	10.83	(10.90)	8.85	(8.94)	6.67	(6.60)	2.18	1.98	4.48
1989	355	90,503.70	15.67	10.18	9.33	7.01	0.079	0.470	10.18	(9.97)	8.50	(8.24)	8.11	(8.03)	0.39	1.68	5.20
1990	304	61,932.86	14.52	10.17	10.66	9.48	0.066	0.609	10.36	(10.36)	8.55	(8.54)	7.49	(7.63)	1.06	1.81	5.65
1991	632	118,896.44	13.83	10.16	10.69	9.16	0.014	0.177	9.80	(9.88)	7.86	(7.97)	5.38	(5.52)	2.48	1.94	2.67
1992	881	176,046.10	13.38	10.15	9.45	7.13	0.018	0.318	8.98	(9.01)	7.01	(6.95)	3.43	(3.43)	3.58	1.97	3.25
1993	1,090	212,346.09	15.28	10.16	10.18	9.98	0.005	0.388	7.93	(8.00)	5.87	(5.89)	3.00	(3.01)	2.88	2.06	2.45
1994	527	85,950.34	10.87	10.13	8.57	5.11	0.023	0.279	8.62	(8.70)	7.08	(7.21)	4.25	(4.24)	2.83	1.54	2.87
1995	641	108,307.58	14.13	10.15	11.96	10.02	0.031	0.195	8.20	(8.12)	6.58	(6.39)	5.49	(5.45)	1.09	1.62	2.79
1996	753	117,153.30	12.88	10.13	12.19	8.11	0.053	0.153	8.05	(8.13)	6.44	(6.52)	5.01	(5.01)	1.43	1.62	3.04
1997	1,004	122,920.51	13.54	10.13	12.98	10.01	0.053	0.061	7.86	(7.88)	6.35	(6.36)	5.06	(5.05)	1.29	1.51	1.63
1998	1,115	190,308.36	13.11	10.14	11.30	8.12	0.064	0.120	7.22	(7.21)	5.26	(5.48)	4.78	(4.96)	0.49	1.96	1.67
1999	632	130,727.97	9.65	7.11	8.36	5.08	0.033	0.125	7.87	(7.99)	5.64	(5.85)	4.64	(4.56)	1.00	2.23	2.79
2000	515	118,112.24	7.86	5.07	6.89	4.88	0.039	0.134	8.36	(8.35)	6.03	(6.02)	5.82	(5.78)	0.21	2.34	3.72
2001	652	146,794.97	9.91	7.13	7.39	5.07	0.028	0.229	7.95	(7.95)	5.02	(5.10)	3.39	(3.50)	1.63	2.93	1.20
2002	615	107,599.59	9.86	7.13	7.98	5.08	0.018	0.164	7.80	(7.88)	4.61	(4.78)	1.60	(1.67)	3.01	3.19	2.59
2003	459	121,571.53	11.63	10.14	10.24	9.55	0.020	0.129	6.77	(6.76)	4.02	(4.02)	1.01	(0.95)	3.00	2.75	1.97
2004	323	83,625.66	11.62	10.13	9.96	8.39	0.012	0.158	6.39	(6.36)	4.27	(4.21)	1.37	(1.30)	2.90	2.12	2.90
2005	248	77,764.54	15.58	10.16	14.04	10.15	0.004	0.125	6.06	(6.03)	4.29	(4.24)	3.15	(3.10)	1.14	1.77	4.03
2006	292	120,939.73	14.55	10.15	12.49	10.14	0.017	0.140	6.48	(6.43)	4.79	(4.73)	4.73	(4.80)	0.06	1.69	2.09
All Years	**17,404**	**3,573,056.25**	**16.16**	**13.76**	**11.00**	**8.77**	**0.03**	**0.30**	**9.62**	**(9.62)**	**7.58**	**(7.59)**	**5.97**	**(5.99)**	**1.62**	**2.04**	**4.69**

Figure 3.1 Monthly Debt Issuances and Yields

This figure shows the monthly distributions of average interest rates and spreads, and proceeds of debt issuance for the sample of 17,404 during the period 1970 - December 2006. Baa denotes the Moody's Seasoned Baa Corporate bond yields, and G10 denotes the 10-year constant maturity Treasury bond yields. Term spread is defined as the difference between the 10-year constant maturity Treasury bond rates and the 90-day Treasury bill rates. Risk Spread is defined as the difference between the Moody's Seasoned Baa Corporate bond yields and the 10-year constant maturity Treasury bond rates. Proceeds of debt issuance have the unit of the million dollars constant in March 2005.

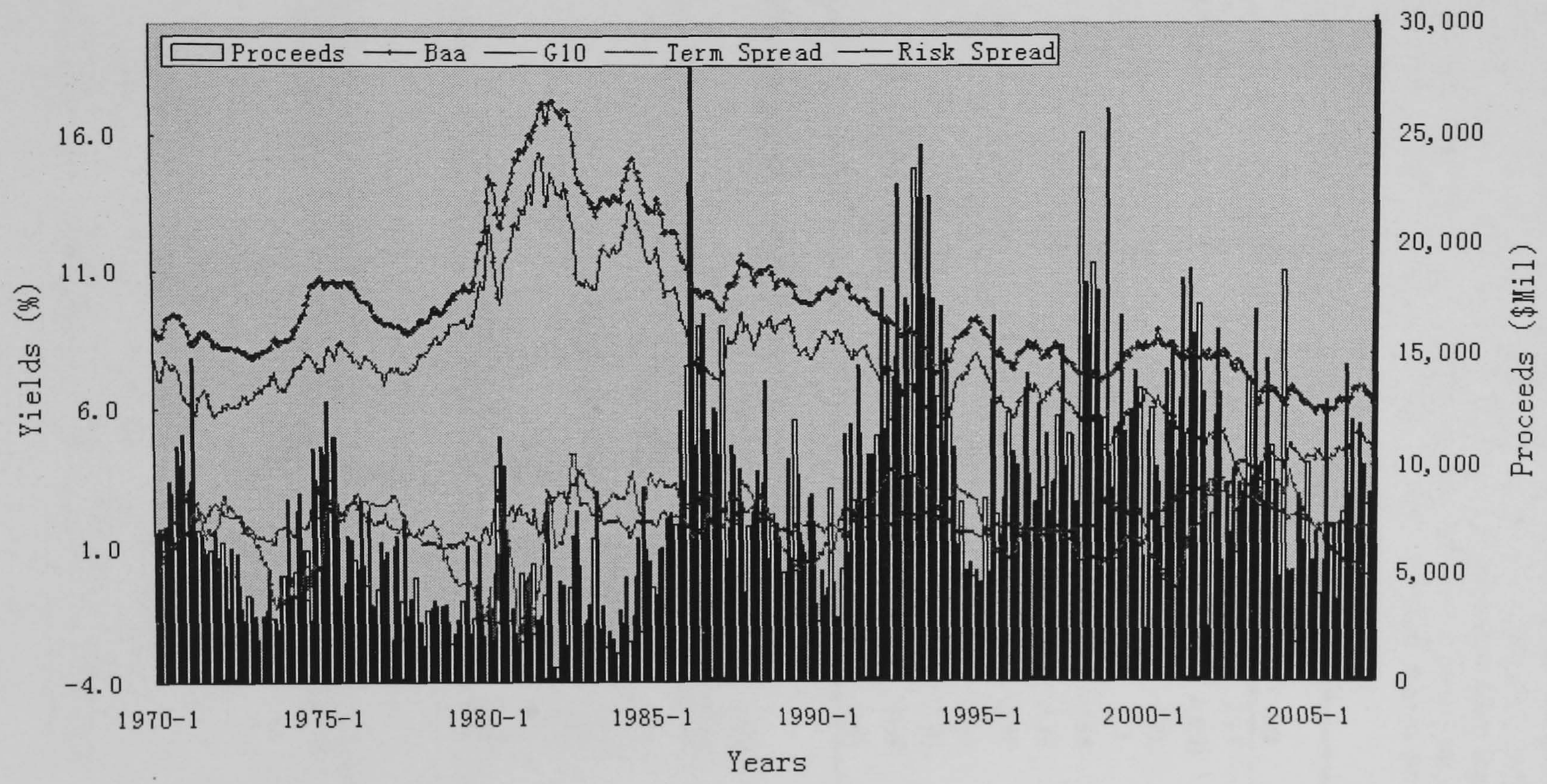

Table 3.2 Sample Statistics and Correlations

This table presents the basic sample statistics based on the monthly data. Monthly issue amounts are measured in millions of dollars (constant in March 2005). ***Maturity*** and ***effective maturity*** are taken as the median value of each month. ***Effective maturity*** is measured by the horizons from the issuing date to the earliest call (put) date, available from 1976 in the SDC bond issue database. ***Baa*** is the Moody's Seasoned Baa Corporate Bond Yield. ***T90*** is the 90-day Treasury bill rate and G10 is the 10-year constant maturity Treasury bond rate. ***Term spread*** is the difference between the 10-year Treasury bond rates (G10) and the 90-day Treasury bill rates (T90). ***Risk spread*** is the difference between the Moody's Seasoned Baa Corporate Bond Yield s and the 10-year Treasury bond rates. ***Real short-term rates*** (T90t-Inft) were estimated as the annualised 90-day Treasury bill rates (T90) minus the actual inflation rates (Inflation). The US Coincident Index (***USCI***) introduced as the proxy for the business cycle indicator in the US economy is generated from the Economic Cycle Research Institute (ECRI). ***Excess bond returns*** are defined as the annualised three-year cumulative excess returns, measured as the third root of the compounded monthly corporate bond returns on the T-bills over 36 months, minus one.

Panel A Monthly statistics

	Mean	Median	SD
Monthly issue numbers	39.2	32.0	24.3
Monthly issue amounts ($Mil)	7,959	7,019	4,830
Maturity (year)	14.2	10.2	7.0
Effective maturity (year)	11.0	10.0	6.7
Fraction of puttable	0.03	0.00	0.04
Fraction of callable	0.24	0.21	0.18
Baa (%)	9.62	9.00	2.52
G10 (%)	7.58	7.30	2.49
T90 (%)	5.97	5.48	2.88
Term spread (%)	1.62	1.71	1.30
Risk spread (%)	2.04	1.94	0.57

Paneal B Correlations of debt issue characteristics with interest rates and spreads

	Baa	G10	T90	Term spread	Risk spread
Number of issues	-0.311	-0.354	-0.384	0.171	0.177
Monthly issue amounts	-0.358	-0.416	-0.417	0.127	0.242
Maturity	0.078	0.135	0.208	-0.202	-0.250
Effective maturity	0.167	0.223	0.278	-0.196	-0.263
Fraction of puttable	0.223	0.217	0.158	0.066	0.032
Fraction of callable	0.376	0.389	0.248	0.195	-0.040

Panel C Correlations between market condition variables

	Term Spread	Risk Spread	Inflation	USCI	Real short rate
Term Spread	1				
Risk Spread	0.285	1			
Inflation	-0.178	-0.152	1		
USCI	0.060	-0.216	-0.261	1	
Real short rate	0.033	-0.027	-0.224	0.262	1
Excess Bond returns	0.195	0.415	-0.234	-0.313	0.437

3.4. Debt market conditions and corporate debt issues

In this section an examination is made of the evidence of debt market timing in previous empirical studies that the features of corporate debt issuance including maturity and issue volume are determined by fluctuations in the debt market conditions. Based on the recent debate about whether firms can successfully time the debt market, the starting point is the empirical work of Baker et al. (2003) regarding contemporary variations between market conditions and the maturity of debt issues. However, the focus of the present section is to question the arguably casual link of the contemporary variations. Therefore, the lead-lag relationship is then examined and the plausible cause-effective links between firms' debt issue decisions and market conditions are discussed. This will reveal whether debt issue decisions are based on the previous market condition fluctuations or expected future market variations. This is a prerequisite to understanding the relationship between debt issues and debt market timing. The implications arising in this section are examined in the subsequent section, by analysing the debt issue variation under current and *ex post* future market conditions in the backward and forward directions.

3.4.1. Co-variations between debt market conditions and debt issues

An important finding in Baker et al. (2003) is that market conditions explain a large fraction of the time series variations in debt maturity. The share of long-term debt over total debt issued is negatively related to inflation, the real short-term rate and the term spread. The interpretation is that firms tend to issue long-term debt when the debt market variables suggest a lower cost of long-term debt, and *vice versa*. Meanwhile, the debt maturity has an identical relationship with the expected excess bond returns estimated from the same variation of market condition factors. As a result, the aggregate average maturity of debt issues itself is verified as being able to predict future excess bond returns.

These results cast suspicion over whether the appearance of a significant relationship is simply an objectively existing phenomenon or whether it reflects a causal link between the maturity of debt issues and the market conditions, in other words, the ability of firms to time their decisions regarding debt maturity on the expected market conditions. As argued by Butler et al. (2006), if an exogenous factor were influencing each of two uncorrelated random variables, one would expect the two series to exhibit a significant correlation, even if this correlation does not mean there is a causal link between these two random variables. With the control of the structural shifts during the sample period, the correlation between the long-term share and future excess returns disappears. Therefore, this "seeming" relationship is possibly spurious. In terms of this argument, there is no reason to assume that corporate debt maturity is entirely uncorrelated to debt market conditions, as it would be surprising if managers executed strategies for their debt issues regardless of the debt market environment. On the other hand, we suspect that debt maturity could predict future debt market variability or returns, or put differently, managers are able to successfully time the debt market. Instead of identifying the effects of exogenous structural breaks on interest rates as in Butler et al. (2006), the present section directly examines the relationship between debt maturity and market condition factors.

When managers make decisions regarding debt maturity, they will inevitably look at the current interest rates. However, this is not enough for them to understand the market variability. Both the absolute magnitude and the relative level of interest rates affect the choice. The contemporary relationship between debt maturity and the debt market variables does not show that managers successfully predict the market variability. Instead, firms may only be reacting to (as opposed to accurately forecasting) the variation in relation to the cost of long-term debt. The problem still remains as to whether current interest rates can predict future bond returns because of the usual difficulties of testing market efficiency. Since bond returns are determined by the instantaneous variation of debt market condition variables such

as interest rates or term structures, and both bond returns and the debt market condition variables can proxy the costs of debt issues, it is possible to examine how the current aggregate level of debt maturity is related to the future market conditions that are directly related to the future returns *ex post*. If the current aggregate level of debt maturity accurately predicts the future market conditions with the assumption that firms time the market to lower the costs of capital, an increase in interest rates and a steep slope in the term structures after debt issues would be expected. Otherwise, it can only be proved that managers are *trying* to time the debt market based on the contemporary co-variation between debt maturity and market variables. Therefore, an examination is made of whether the lagged market condition variables determine the debt maturity.

Debt market timing can be explained as firms issue more debt before interest rates rise and issue more long-term debt when the market suggests the costs of long-term debt will be relatively higher compared to the short-term debt. It is necessary to examine both the debt maturity and the aggregate debt issue amounts. Baker et al. (2003) employed the annual aggregate long-term share of debt issues (the annual percentage of the long-term debt in the total debt issues) to measure the level of debt issues and isolate the maturity decision. One potential problem with this variable is that, as it measures the variation of market-wide aggregate long-term debt issues related to the total debt issues, it is potentially biased to measure the preference of issuers' maturity decisions by some particular large-size issues that may not represent the overall market-wide tendency of debt issues. Also, as they admit, this variable does not include details of maturity, and whether most changes happen between short and long maturities or intermediate and long maturities. In the present chapter the equal-weighted average maturity of all the debt issues for each month has been used to measure the maturity decisions. As each issue decision has an equal weight, it more accurately measures the preference for long-term debt and the details of maturity variations. In addition, the issue amounts were also examined to test the timing choices of the debt issues. The debt issue

amounts were cumulated for each month. As there may be similar shortcomings as regards the issue size effect, the monthly issue numbers were examined as a robustness check. In order to examine the contemporary relationship between the debt issues and market conditions the following regression was run.

$$M_t = a + bTIME_t + cInflation_t + dRiskSpread_t + eTermSpread_t + f\,\mathrm{Re}alRates_t + gUSCI_t + u_t \quad (3.1)$$

The issue amounts and the average maturity of all issued debt were calculated for each month. These two variables were employed as the alternative dependent variables detached from the long-term share of debt issues. This specification included four variables[54] representing the debt market conditions: the actual inflation ($Inflation_t$), the real short-term rate ($Realrate_t$), the term spread ($TermSpread_t$), and the risk spread ($RiskSpread_t$), following the framework of Baker et al. (2003). In addition, the time trend ($Time_t$) was controlled. The US Coincident Index ($USCI_t$)[55] was introduced as the indicator of the macro-economy to control for the business cycles during the sample period covering 37 years.

Following Baker et al. (2003), the second specification was set up by using the excess bond returns ($Return_t$) accumulated in the following three years to explain the variations in the debt issues. This regression shows more directly that the maturity and amount of debt issues was sensitive to variations in capital costs. The time trend is still involved.

$$M_t = a + bTIME_t + h\,\mathrm{Re}turn_t + u_t \quad (3.2)$$

Next, the causal link was investigated using the lagged market condition variables. The horizons were one or two years backward, and one, two or three years forward from the time of the debt issues. This specification identifies what information determined the firms' decisions regarding debt issues, i.e. the past or the expected future.

$$M_t = a + bTIME_t + cInflation_{t+i} + dRiskSpread_{t+i} + eTermSpread_{t+i} + f\,\mathrm{Re}alRates_{t+i} + gUSCI_{t+i} + u_t \quad (3.3)$$

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[54] See the definitions of variables in the subsequent sub-section 3.4.2.
[55] See details of USCI in footnote 53.

where i = -12, -24, 12, 24 and 36 months. When i is negative, representing the past debt market conditions, negative coefficients of the debt market variables would be expected if the firms were detecting that the current costs of debt were low and issuing more debt accordingly. When i is positive, representing the future expected market conditions, a positive relationship would be expected between the debt market variables and the debt issue variables, provided that the firms were accurately predicting the future market variations and adopting strategies to lower the costs.

In contrast to the annual time series of aggregate market data from the Federal Reserve *Flow of Funds* in Baker et al (2003), firm-level corporate debt issue data from the Thompson Finance SDC new issue database was used in the present chapter, which is better able to measure firms' timing ability due to the equal weight of each debt issue. Since the debt issue data in the SDC[56] starts from 1970, the sample covers the post-1970 period in contrast to the period 1953-2000 in Baker et al. (2003). The sample set contained 17,404 observations screened by the search criteria. Then, 444 monthly portfolios of corporate debt issues were constructed, as this is better able to reflect instantaneous variations in the debt market environment. The average monthly mean maturity was 16.2 years (with a standard deviation of 5.2 years)[57], while the average monthly issue volume and issue number were 7,959 million dollars (with a standard deviation of 4,829.6 mil$) and 39 issues (with a standard deviation of 24.3).

The actual inflation was the annual percentage change of the consumer price index in each monthly observation. The real short-term rate was estimated as the 90-day Treasury bill rates minus actual inflation. The term spread was the difference between the 10-year constant maturity Treasury bond rates and the 90-day Treasury bill rates. The risk spread was estimated as the 10-year constant maturity Treasury

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[56] In addition, the data collection may be potentially incomplete in the first few years, although this does not affect our results. These may be a potential limitation of the data. However, compared to the shortcomings of the aggregate market-level data as mentioned above, our sample has the unique strength of the issue details as regards maturity and amounts.

[57] In the interests of brevity, the details are not reported here.

bond rates minus the Moody's seasoned Baa corporate bond yield. Excess bond returns were measured by an index of investment-grade corporate bonds over an index of Treasury bills, generated from Ibbotson Associates. The annualised three-year cumulative excess returns were calculated as the third root of the compounded monthly returns of the corporate bond index over the compounded monthly returns of Treasury bills during the assumed holding period of 36 months, minus one.

3.4.2. Empirical results and implications

Table 3.3 presents the results of the contemporary relationship between the debt issues and the market condition variables, following Baker et al. (2003). The average maturity was negatively related to inflation, the real short-term rate, risk spread and term spread. The pattern of the coefficients exactly corresponds to the pattern in Baker et al. (2003) despite the use of a different dataset. Baker et al. (2003) verified that the maturity of debt issues responds to the same variation in market conditions that governs the relative cost of long-term debt by using the expected excess returns predicted from these market condition variables. The consistent results were also found showing that even the realized excess returns have explanatory power regarding aggregate maturity variations. The monthly issue numbers and volumes with the control of the economic growth indicator were negatively correlated with the debt market conditions as expected. In line with Baker et al. (2003), the evidence seems to suggest that the market conditions explain a large fraction of the time series variation in maturity.

Provided that managers can anticipate the future market conditions and change the timing and maturity of their debt issues accordingly, it would be expected that there would be increasing costs of capital suggested by the market conditions following debt issuances. On the other hand, if managers suspend their debt issuances on purpose and the market environment changes as they predict, the costs of debt issuance should be lower compared to the previous level. To examine the

rationality of the implication drawn from the above evidence, the lead-lag relationship between the debt issue variables and debt market conditions was tested. The horizons of two/three years backwards and forwards were examined. The results reported in Table 4 show that a negative relationship between the debt issues and market conditions uniformly existed for all the specifications. The negative coefficients of the market variables prior to the debt issues can be explained by the timing hypothesis, which suggests that the firms issued less (more) debt or short-term (long-term) debt when the pre-issue market conditions implied high (low) costs of debt issues. However, the pattern of relationship between the debt maturity/volume and subsequent debt market conditions was not consistent. The firms did not issue more long-term debt before an interest rate rise. No debt maturity was found and the variations in the issue volumes were positively related to the lagged market condition variables, which suggests that the firms failed to increase their debt issuances and extend debt maturity before the increasing costs, and therefore their attempts at timing the future debt market were at least unsuccessful.

The consistently negative relationship between the debt issues and market conditions existed but cannot be explained by the successful market timing of the debt issuers. Lagged behind the market variations, the firms' decisions were consistent with the market timing hypothesis based on the historical information of pre-issue market conditions, but against the hypothesis when associated with *ex post* future market variations. Therefore, the significant relationship between the debt maturity and market condition factors is more likely to favour the "pseudo market timing" hypothesis suggested by Schultz (2003). This chapter avoids the debate concerning whether there is a genuine or pseudo relationship between debt maturity and debt market variables. Rather, in the subsequent sections the variations in debt maturity and issue volumes are directly examined following the above findings.

Table 3.3 Contemporary Relationships between Corporate Debt Issues and Debt Market Conditions

This table presents the relationship between the debt market conditions and the corporate debt issue decisions specified by the regressions 3.1 and 3.2. The corporate debt issue data was generated from the SDC bond issue database covering the sample period 1970 - 2006. The dependent variables, M_t, are logarithmic monthly average maturities and issue amounts of the corporate bonds based on the above sample. The monthly issue amounts are measured in millions of dollars (constant in March 2005). The debt market conditions include the actual inflation. risk spread (difference between Moody's Seasoned Baa corporate bond yields and the 90-day Treasury bill rates), the term spread (the 10-year constant maturity Treasury bond rates and the 90-day Treasury bill rates), and the real short-term rates. The US Coincident Index (*USCI*) is the comprehensive indicator of the US economic conditions involving production, employment, income and sales, produced by the Economic Cycle Research Institute (www.businesscycle.com). Meanwhile, the time factor is also controlled. In the regression (3.2), the excess corporate bond returns ($Return_t$) are measured as the cumulative returns of the corporate bond index over the Treasury bill in the 36 months after each monthly observation. The t-statistics are heteroskedasticity robust and correct for time-series dependence up to 2 lags.

$$M_t = a + bTIME_t + cInflation_t + dRiskSpread_t + eTermSpread_t + f\,\mathrm{Re}alRates_t + gUSCI_t + u_t \quad (3.1)$$

$$M_t = a + bTIME_t + h\,\mathrm{Re}turn_t + u_t \quad (3.2)$$

N	Trend		Risk spread		Inflation		Term Spread		Real short-term rates		USCI		Excess return (36m)		R^2
	b	[t]	c	[t]	f	[t]	g	[t]	h	[t]	j	[t]	k	[t]	
Monthly Average Maturity (Ln)															
444	-0.002	[-20.8]	-0.065	[-2.82]	-0.023	[-3.73]	-0.034	[-3.5]	-0.029	[-5.88]	0.003	[0.601]			0.648
408	-0.002	[-25.9]											-0.014	[-9.14]	0.733
Monthly Issue Amount (Ln)															
444	0.000	[1.1]	0.031	[0.542]	-0.144	[-9.66]	-0.088	[-3.66]	-0.080	[-6.4]	-0.070	[-5.89]			0.375
408	0.003	[9.92]											-0.006	[-1.2]	0.212
Monthly issue Number															
444	0.015	[1.42]	-1.359	[-0.576]	-4.414	[-7.11]	-1.307	[-1.33]	-0.916	[-1.77]	-2.077	[-4.23]			0.261
408	0.139	[14.7]											-0.658	[-3.71]	0.358

Table 3.4 Lead-lag Relationships between Corporate Debt Issues and Debt Market Conditions

This table presents the relationship between the corporate debt issue decisions and the past or future debt market conditions specified by the regressions 3.3. The debt market condition factors are taken 12 and 24 months backward and 12, 24, 36 months forward respectively. The corporate debt issue data was generated from the SDC bond issue database covering the sample period 1970 - 2006. The dependent variables, M_t, are the logarithmic monthly average maturities and issue amounts of the corporate bonds based on the above sample. The monthly issue amounts are measured in millions of dollars (constant in March 2005). The debt market conditions include the actual inflation, the risk spread (the difference between Moody's Seasoned Baa corporate bond yields and the 90-day Treasury bill rates), term spread (the 10-year constant maturity Treasury bond rates and the 90-day Treasury bill rates), and the real short-term rates. The US Coincident Index (USCI) is the comprehensive indicator of the US economic condition involving production, employment, income and sales, produced by the Economic Cycle Research Institute (www.businesscycle.com). Meanwhile, the time factor is also controlled. The t-statistics are heteroskedasticity robust and correct for time-series dependence up to 2 lags.

$$M_t = a + bTIME_t + cInflation_{t+i} + dRiskSpread_{t+i} + eTermSpread_{t+i} + f\,\mathrm{Re}alRates_{t+i} + gUSCI_{t+i} + u_t \qquad (3.3) \qquad i = \text{-12, -24, 12, 24 and 36}$$

	N	Trend		Risk spread		Inflation		Term Spread		Real short-term rates		USCI		R^2
		k	[t]	c	[t]	f	[t]	g	[t]	h	[t]	j	[t]	
Monthly Average Maturity (Ln)														
-12	444	-0.002	[-19.5]	-0.074	[-2.67]	-0.008	[-1.26]	0.028	[2.47]	-0.026	[-4.97]	0.003	[0.445]	0.642
-24	444	-0.002	[-19.1]	-0.093	[-3.04]	0.001	[0.125]	0.075	[5.91]	-0.027	[-5.02]	-0.002	[-0.324]	0.663
12	432	-0.002	[-17.5]	-0.100	[-3.5]	-0.003	[-0.414]	-0.023	[-2.01]	-0.023	[-4.6]	0.010	[1.69]	0.666
24	420	-0.002	[-15.1]	-0.114	[-3.64]	0.016	[2.15]	-0.003	[-0.22]	-0.012	[-2.32]	0.011	[1.43]	0.706
36	408	-0.002	[-12.3]	-0.108	[-3.13]	0.023	[2.68]	-0.020	[-1.42]	-0.001	[-0.268]	0.011	[1.11]	0.712
Monthly Issue Amount (Ln)														
-12	444	0.001	[2.44]	-0.360	[-5.04]	-0.132	[-8.21]	-0.061	[-2.05]	-0.022	[-1.6]	-0.117	[-7.92]	0.316
-24	444	0.001	[3.12]	-0.604	[-7.56]	-0.132	[-8.06]	-0.044	[-1.31]	0.017	[1.18]	-0.136	[-7.59]	0.346
12	432	0.000	[0.465]	0.064	[0.859]	-0.149	[-8.58]	-0.067	[-2.27]	-0.086	[-6.41]	-0.040	[-2.49]	0.339
24	420	0.000	[0.96]	0.105	[1.2]	-0.143	[-6.96]	-0.076	[-2.15]	-0.094	[-6.6]	0.004	[0.197]	0.336
36	408	0.000	[0.815]	-0.044	[-0.461]	-0.167	[-7.01]	-0.139	[-3.49]	-0.101	[-6.87]	0.000	[-0.007]	0.363

3.5. Forward-looking and backward-looking market timing

As described in the preceding section, the implications of the timing hypothesis as regards the contemporary relationship between corporate debt issues and market condition variables cannot explain the lead-lag relationship. It has not been seen that debt maturity and issue volume are positively correlated with the future market condition variables. Therefore, debt issues do not increase before interest rate rises and debt maturity does not tend to be longer before the costs of long-term debt increase. Hence, the question is what managers consider regarding their debt maturity structure at the time they issue their debt. The survey of Graham and Harvey (2001) indicated that managers "attempt to time interest rates by issuing debt when they feel that market interest rates are particularly low" (p.223). The "particularly low" interest rates can be understood as managers believing the interest rates are expected to increase in the future, which is a form of forward market timing, or that the current interest rates are relatively low compared to the historical level, referred to as backward market timing. As a matter of fact, some results in the survey study could be explained as forward-looking market timing, i.e. making debt issue decisions based on the prediction of future market conditions, while other results could be explained as backward-looking timing, i.e. responses to the current market fluctuation compared to past information. This is the key reason for the argument about firms' timing abilities for debt issuance. On the one hand, supportive evidence only arguably shows a significant correlation between debt issues and market variations. On the other hand, contradictory views emphasize the extent to which firms' financing policies depend on the prediction of future markets. This viewpoint has not hitherto been clarified or examined empirically. In this section, the efforts of managers to time the interest rates in the sense of forward and backward directions are examined.

3.5.1. Debt issues and subsequent changes in interest rates

One reason for timing future debt markets is that managers believe they possess

information not reflected in the market prices of debt. Successful forward-looking market timing means making accurate predictions of the future market conditions and appropriately implementing financing policies accordingly. If interest rate timing is successful, it would be expected that large levels of long-term debt issuances would be followed by an increase in interest rates, an increase in the spreads or negative excess bond returns. Instead of the conventional method of regression, the interest rate-related factors subsequent to the debt issues are examined directly.

Firstly, the changes of interest rate during a given horizon after each month were measured. The changes of interest rate may be positive or negative. If managers can accurately predict the changes of future interest rates, they will choose to time their debt issues before a positive interest rate change. Conversely, less debt will be issued before a negative interest rate change. An example is now given to explain the empirical strategy. From the 1^{st} month to the 6^{th} month, the interest rate increases by 100 basis points, while it decreases by 100 basis points if measured from the 2^{nd} month to the 7^{th} month. The average interest rate changes in the subsequent 6 months for the 1^{st} month and the 2^{nd} month will be zero. If in each of the 1^{st} and 2^{nd} months there are one million dollars of debt issued, and the 6-month forward interest rate changes of each of these months is weighted by the issue volumes, the value-weighted interest rate changes in the two months will be exactly zero. However, assuming that firms issue more debt before interest rate increases and less debt before it decreases, for example, 2 million dollars of debt in the 1^{st} month and zero in the 2^{nd} month, the value-weighted interest rate changes in the two months will be equal to 200 basis points. Put this into the aggregate market-level debt issues and there would be an expectation of significantly larger average value-weighted interest rate changes than the unconditional average interest rate changes, provided that the firms have successfully timed the market. Conversely, no significantly positive difference between the value-weighted average interest rate changes and the unconditional average interest rate changes

would be expected if the firms have failed to predict the variation in future interest rates. This is the strategy followed in the tests here.

The debt issues sample was still sorted by calendar months. The average debt maturity and the issue volume were obtained for each month. Taking into consideration that in most cases managers make decisions regarding debt issues three to six months before the actual issue dates, the average future interest rate changes during the period starting from three months before the issue month and covering the given horizons which were tested at 6, 12, 18, 24 and 36 months were calculated.

We used the annual rates of the Moody's Seasoned Baa[58] corporate bond (Baa) and the 10-year constant maturity Treasury bond (G10) as the proxies for the market interest rates. The average yields of the Baa and G10 were 9.62% (with a standard error of 2.52%) and 7.58% (with a standard error of 2.49%), respectively, during the period January 1970 - December 2006. The term spreads and risk spreads[59] were also examined to measure the possibility that the managers had the ability to time the slope of the yield curve. The average term spread between the G10 and the 90-day Treasury bill was 1.61% (with a standard error of 1.31%) during the period January 1970 - December 2006, while the average risk spread measured by the Baa yield and G10 was 2.04% (with a standard error of 0.56%) during the same period.

Table 3.5 presents the results of the above analysis. Panel A shows the differences between the unconditional mean yield changes and the value-weighted mean yield changes based on the Baa debt and the ten-year Treasury bond. The unconditional mean of the yield changes shows that the average variations over 6, 12, 18, 24 and 36 months across the whole sample period were uniformly negative but not statistically significant. It would be expected that the value-weighted mean yield

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[58] Aaa rate corporate bond yields were also examined as the alternative measure of interest rate. The results are qualitatively similar, but not reported here.

[59] The measures of spreads are the same as they defined in the preceding section.

changes would be significantly larger than the unconditional mean yield changes if the managers were succeeding in timing the market and implementing the correct strategy of debt issuance to lower the costs. The first set of results show the difference between the proceeds-weighted mean yield changes and the unconditional yield changes for the various horizons. For example, on average the proceeds-weighted mean of the Baa yield changes in six months was 3.2% less than the unconditional mean yield changes, which is statistically insignificantly different from zero. The results for the other horizons measured by the Baa yield exhibited a similar pattern (negative and insignificant) with the exception of the 36 month horizon (significant but negative), while for the G10 yield there was no significant difference between the average yield changes and the proceeds-weighted yield changes for all the horizons from 6 months to 36 months. However, the negative differential mean yield changes of the Baa in 36 months suggest a failure of market timing. For all the tested horizons, the results suggest that there was not less debt issued before the subsequent interest rate decline. Rather, in some circumstances, more debt was issued before the interest rate declined, as the negative differential yield changes suggest that heavy weight (issue volume) was given to the months when the subsequent interest rate changes were negative.

The second set of results in Panel A show the maturity-weighted differences in the subsequent interest rates. The same method was used to calculate the subsequent yield changes in each month and they were weighted by the average stated maturity of the debt issued. The differences between the maturity-weighted yield changes and the unconditional yield changes were recorded for the 6, 12, 18, 24 and 36 month horizons. Very interestingly, the results clearly support the findings of Baker et al. (2003) that managers can time the debt maturity. The maturities tended to correctly anticipate the future changes in both the Baa and Treasury yields across all the horizons. The significance was more obvious for the horizons of longer than 6 months and was greatest for the 36 month horizon. However, it is

not yet known whether this result can be attributed to accumulative pseudo market timing as stated in Butler et al. (2006). The above investigations were extended by introducing other debt features in subsequent tests.

If firms issue only a very little long-term debt or the average maturity is relatively short prior to an increased interest rate, this does not suggest an ability to time the market. Therefore, the present study examined both simultaneously. The third set of results shows the differential yield changes weighted by both issue amounts and maturity. It still indicates a significant timing ability when measured by the Treasury yield changes (G10) for the long horizons. Very interestingly, however, the differential yield changes measured by the Baa yield, which is more indicative of the cost of corporate debt issuance than are government bonds, were greatly weakened and insignificant in the proceeds and maturity-weighted results. In other words, both the economic magnitude and statistical significance declined in contrast to the timing ability implied by the maturity-weighted results.

In addition, the effective maturity was introduced, measured by the horizons between the debt issue dates and the earliest call or put dates, if applicable. The embedded call or put options in debt issues are used to hedge the unpredictable variability of the debt market. For example, firms can execute call options to pay the debt prior to the maturity date in the case where the market interest rate is too low compared to the bond yield. A put option embedded in a debt issue gives investors the right to require the issuer to refinance if the interest rate rises. Effective maturity is more indicative of the expected maturity which is coincident to the situation at the time when the debt is issued, because it is surprising that firms issue debt with a long maturity to hedge the risk of interest rate increases but pay the extra costs to withdraw the debt earlier. Although the extra costs in the case of option execution do not occur at the time of the issue *ex ante*, the term of the option in the debt issuance itself implies the concerns of the managers about the future interest rate volatility. For these reasons the effective maturity was examined

as the alternative measure of the stated maturity.

The results of the differential yield changes weighted by effective maturity were also reported. It was found that the timing ability regarding debt maturity disappeared entirely. In contrast to the results of the maturity-weighted mean yield changes, the differences were economically small and statistically insignificant. There was no obvious tendency of firms issuing long-term debt measured by the effective maturity before the long-term rates increased. If effective maturity reflects the confidence in managers' decision regarding debt maturity at the time of the debt issue, the evidence does not support the notion that managers can successfully forward time interest rates.

Panel B in Table 3.5 shows the results based on the analysis of the spread changes using the same method. As indicated in the survey by Graham and Harvey (2001), firms tend to issue long-term debt when the market suggests a relatively low cost. It would therefore be expected that debt maturity would tend to be long if the future yield curve is expected to become steep. Compared to interest rates, term spread and risk spread should be more correlated to debt maturity. If managers can time the term spread, they should issue more long-term debt before the spread increases. The results in Table 3.5 show that there is no supportive evidence that firms issue more debt or that debt maturity is obviously longer before the spread rises, regardless of whether issue volume or maturity are taken into account. Therefore, firms do not successfully time the future interest rates or spreads.

Rather than examining interest rates and spreads, Baker et al. (2003) indirectly examined debt market timing by using annual excess bond returns. Their results suggested that the long-term share of debt issues can be used to predict future bond returns, and a greater quantity of long-term debt predicts a low excess return. Therefore, the present section directly examined whether the managers could predict future bond returns by replicating the preceding method, with the assumption that firms issue more long-term debt if the expected excess bond

returns are negative. The average excess bond returns were measured in 1, 2 and 3 years and the cumulative excess returns in 3 years subsequent to the debt issues. The returns were calculated by the compounded monthly Baa corporate bond returns over the Treasury bill rates. The results are reported in Table 6. The unconditional average excess returns over the whole sample period were significantly positive. When weighted by debt issue amounts, the differential excess returns were uniformly positive for 1, 2, 3 year and for the cumulative 3 years, which is inconsistent with the timing hypothesis. The maturity-weighted excess returns appear to be significantly negative, consistent with Baker et al.'s finding, while the significance was clearly eliminated when weighted by both amounts and maturity, and completely vanished when weighted by effective maturity. These results exhibit a similar pattern to those shown in Table 3.6.

In summary, the results show that managers are not able to time the future debt market with interest rate levels, spreads and bond returns. Although it was found that debt maturity seems to have a prediction power as regards future markets, it is eliminated or completely vanishes once other debt features are introduced. This analysis did not solely focus on the relationship between maturity and market conditions. The comprehensive factors that managers may be concerned with in practice were also considered, including issue volume and embedded options. Therefore, managers cannot successfully forward time the debt market.

Table 3.5 Interest Rate Changes Subsequent to Debt Issuance

This table shows the average interest rate changes ***i*** months subsequent to debt issuances, where ***i*** = 6, 12, 18, 24 and 36. The unconditional means are the average interest rate changes of ***i*** months after the issuance for each monthly observation across the whole sample period from January 1970 to March 2005. The differential yield changes are defined as the differences between the unconditional means and the conditional means which are weighted by proceeds, maturity, proceeds-maturity and effective maturity respectively. For the effective maturity, the sample period starts from January 1976 due to the data availability. The table also presents the t-values for the null hypothesis that the differential yield changes are zero. In Panel A, the Moody's Seasoned Baa Corporate bond yield (Baa) and the 10-year Treasury bond yield (G10) are examined. Panel B examines the term spread (the difference between the 10-year Treasury bond rate and the 90-day Treasury bill rate) and the risk spread (the difference between the Moody's Seasoned Baa Corporate bond yield and the 10-year Treasury bond rate) using the same processes.

Panel A

Baa					**G10**				
Unconditional Means									
6 months	12 months	18 months	24 months	36 months	6 months	12 months	18 months	24 months	36 months
-0.041	-0.084	-0.111	-0.143	-0.201	-0.048	-0.085	-0.101	-0.123	-0.181
[-1.091]	[-1.372]	[-1.409]	[-1.556]	[-1.745]	[-1.031]	[-1.236]	[-1.236]	[-1.353]	[-1.732]
Differential Yield Changes									
Proceeds Weighted Means									
-0.032	-0.028	-0.029	-0.084	-0.144	-0.015	0.025	0.041	0.014	-0.013
[-0.896]	[-0.521]	[-0.439]	[-1.223]	[-1.953]	[-0.304]	[0.433]	[0.565]	[0.242]	[-0.143]
Maturity Weighted Means									
0.064	0.143	0.214	0.274	0.384	0.068	0.144	0.203	0.257	0.342
[1.476]	[2.080]	[2.348]	[2.535]	[2.736]	[1.465]	[2.169]	[2.421]	[2.643]	[2.829]
Proceeds-Maturity Weighted									
0.012	0.056	0.101	0.080	0.096	0.032	0.113	0.180	0.187	0.222
[0.269]	[1.022]	[1.455]	[1.135]	[1.241]	[0.721]	[1.877]	[2.403]	[2.643]	[2.982]
Effective-Maturity Weighted									
0.026	0.070	0.096	0.126	0.140	0.039	0.075	0.070	0.077	0.028
[0.522]	[0.908]	[0.945]	[1.018]	[0.861]	[0.671]	[0.904]	[0.678]	[0.635]	[0.164]

Panel B

Term Spread					**Risk Spread**				
Unconditional Means									
6 months	12 months	18 months	24 months	36 months	6 months	12 months	18 months	24 months	36 months
0.007	-0.006	-0.033	-0.059	-0.049	0.007	0.001	-0.010	-0.020	-0.020
[0.078]	[-0.145]	[-0.431]	[-0.717]	[-0.486]	[0.193]	[-0.079]	[-0.332]	[-0.591]	[-0.486]
Differential Yield Changes									
Proceeds Weighted Means									
0.025	0.068	0.036	-0.065	-0.213	-0.017	-0.053	-0.070	-0.098	-0.131
[0.436]	[0.922]	[0.408]	[-0.806]	[-1.933]	[-0.791]	[-1.803]	[-2.043]	[-2.588]	[-2.725]
Maturity Weighted Means									
-0.006	-0.013	-0.004	-0.004	0.001	-0.003	-0.001	0.011	0.017	0.042
[-0.159]	[-0.251]	[-0.095]	[-0.128]	[-0.023]	[-0.241]	[-0.167]	[0.173]	[0.285]	[0.842]
Proceeds-Maturity Weighted									
0.021	0.072	0.046	-0.063	-0.258	-0.020	-0.057	-0.079	-0.108	-0.126
[0.334]	[1.016]	[0.540]	[-0.831]	[-2.500]	[-0.917]	[-1.912]	[-2.272]	[-2.866]	[-2.672]
Effective-Maturity Weighted									
-0.019	-0.063	-0.068	-0.079	-0.036	-0.013	-0.005	0.026	0.049	0.111
[-0.273]	[-0.760]	[-0.697]	[-0.737]	[-0.201]	[-0.417]	[-0.085]	[0.687]	[1.202]	[2.199]

Table 3.6 Excess Bond Returns Subsequent to Debt Issuance

This table shows the average excess bond returns in *i* years subsequent to debt issuances, where *i* = 1, 2 and 3. and the cumulative excess bond returns in the 3 years subsequent to the debt issuances. The unconditional means are the excess bond returns in *i* years after the issuance for each monthly observation across the whole sample period from January 1970 to March 2005. The differential yield changes are defined as the differences between the unconditional means and the conditional means which are weighted by proceeds, maturity, proceeds-maturity and effective maturity. For the effective maturity, the sample period starts from January 1976 due to the data availability. The table also presents the t-values for the null hypothesis that the differential yield changes are zero. Both the returns of the corporate bond index and the government bond index are examined. The bond return data was obtained from the Ibbotson Associate 2006 Yearbook.

Excess Corp. Bond Returns				Excess Govt. Bond Returns			
1 year	2 years	3 years	Cum 3	1 year	2 years	3 years	Cum 3
Unconditional Means							
0.036	0.035	0.034	0.030	0.035	0.033	0.032	0.028
[7.190]	[9.388]	[11.062]	[9.908]	[6.609]	[8.889]	[10.599]	[9.439]
Differential Yield Changes							
Proceeds Weighted Means							
0.003	0.004	0.003	0.004	0.005	0.005	0.004	0.005
[0.658]	[1.117]	[1.393]	[1.629]	[0.849]	[1.503]	[1.608]	[1.798]
Maturity Weighted Means							
-0.012	-0.012	-0.010	-0.011	-0.013	-0.012	-0.011	-0.011
[-2.301]	[-2.833]	[-2.988]	[-3.063]	[-2.398]	[-3.031]	[-3.145]	[-3.189]
Proceeds-Maturity Weighted Means							
-0.006	-0.006	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
[-1.275]	[-1.829]	[-2.271]	[-2.063]	[-0.915]	[-1.581]	[-2.020]	[-1.900]
Effective-Maturity Weighted Means							
-0.005	-0.005	-0.004	-0.005	-0.006	-0.006	-0.005	-0.006
[-0.829]	[-0.999]	[-1.152]	[-1.390]	[-0.955]	[-1.202]	[-1.417]	[-1.613]

3.5.2. Debt issues and relative levels of interest rates

The notion that managers issue debt when the interest rates are particularly low can be explained as their choosing a time when the current interest rates are relatively lower than their recent historical levels. It is easy to understand that managers refer to the available information when making decisions regarding debt issues. On the one hand, managers may believe it is good timing to issue debt when the current interest rate is low. On the other hand, they may postpone debt issues if the current interest rate is not low but is expected to decline in the near future. In both cases, a low interest rate level will be seen at the time of the debt issue compared to the previous level. This is referred to as the backward market timing of interest rates, in contrast to forward market timing.

Backward market timing is associated with the relative levels of interest rates as compared to historical levels rather than absolute values of interest rates. It cannot be judged whether a current rate of 8% is high or low. Compared to experiencing a rate of around 12% in previous years, the investor sentiment will be different from having the previous rate of being 5%. Therefore, the relative interest rate level is the focus here. Both the annual yields of the Moody's Seasoned Baa corporate bond (Baa) and the ten-year constant maturity Treasury bond (G10) for each month were used as the benchmark interest rates[60]. The measure of the relative interest rates was constructed by calculating the percentile ranking of the interest rates at the time of the debt issues in the previous ten years[61]. The percentile ranking was sorted by deciles. For example, the rates that ranked at the low end of the historical rate range to the 10^{th} percentile belong to the decile 0. Decile 10 includes the current rates which are located between the 10^{th} percentile and 20^{th} percentile of the historical interest rate range, and so forth. The issue volume and issue number were calculated for each monthly observation. The mean and median of the debt maturity, and the percentages of callable and puttable debt over the total issues in each month were also measured. All monthly observations were sorted by the decile rankings of the relative interest rates.

Table 3.7 presents the results of the above processes. The first thing to notice is that most of the debt issues took place at the time when the relative interest rates belonged to the decile 0, i.e. the lowest ranking of the historical levels. Both the issue volumes and numbers tended to decline as the interest rate percentile rankings increased, although the issue values did not monotonically decrease. This tendency is particularly apparent when measured by the G10. It can be clearly seen that the debt issue values in the months with low decile rates (lower than decile 30) were twice the value in the months with high decile rates (higher than decile 70).

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[60] Meanwhile, the Aaa rate corporate bond rates and the 90-day Treasury bill rates were also examined but not reported here.

[61] We chose 10 years as the measuring horizon in the common sense. In general, investors are more influenced by recent information than that from a long time ago. We also employed the comparing horizon of 5 years prior to the debt issues. The results are qualitatively similar, but not reported here.

This ratio is 2.5 for the numbers of issues. These results are consistent with the backward market timing hypothesis that more debt is issued when interest rates are relatively low compared to the historical level.

The variations in maturity and effective maturity were examined with the relative interest rates. Very interestingly, both the mean and median of the maturities in the months with relative rates from the decile 0 to 50 were stable (about 13 years for the mean and 10 years for the median), while the maturities in the months with higher rates from the decile 60 to 90 sharply lengthened (about 20 years for both the mean and median). The expectation would be for firms to use call options to hedge the risk exposure of expected interest rate decreases when the current interest rates are relatively high, especially for debt with very long maturity. The investigations of the effective maturity certify this assumption. In contrast to the stated maturity, the variation in the effective maturity was flat across the different deciles, although it was still about 2 years higher for the high rate deciles than for the low rate deciles. While no apparent changes were found in the percentage of call and put option usage across the various rate deciles, they did smooth the sharp variation in the debt maturity. Hence, the effective maturity reflects the worries of managers regarding the uncertainty of the future debt market, especially when the relative interest rates are high.

Some may argue that debt issue values and maturities are highly correlated to the economic growth underlying the interest rate itself. In fact, this can explain the reason why debt maturity tends to be long when the relative rates are high, because a relatively high interest rate is normally associated with a tight fiscal policy against the too fast growth of economy and potential crisis of high inflation. Firms then have more investment opportunities and an expectation of the growth being continuous and so raise long-term debt accordingly. Therefore, the US coincident index (USCI) was introduced as the economic indicators and the proxy for business cycles to re-examine the backward timing. In addition, the situation in the stock

market affects the flows of capital and in turn the corporate debt issues. Therefore, the effect of the stock market was also controlled by using the market-to-book value (MTBV) ratio of the S&P 500 index.

The high, middle-high, middle-low and low economic growth periods were categorized by the quartiles of the USCI and the S&P 500 index MTBV ratio during the sample period. For each sub-period, the relative interest rates (Baa and G10) were also sorted by quartiles. The 1st quartile included the months with the current rates located at the low end of the historical rate range of the 25th percentile. The 2nd quartile included the months with the current rates ranked between the 25th and 50th percentile of the historical interest rate range, and so forth. The debt issues across different relative rate quartiles and different levels of economic growth were then examined.

The results shown in Table 3.8 exhibit similar patterns of debt issues to those in Table 3.7. For all the states of economic growth controlled by the levels of the USCI, the debt issue values declined as the relative rate quartile increased, as measured by both the Baa and G10. For example, when the USCI suggested high economic growth, the average monthly debt issue values were 10,535 million dollars during the months with a relative Baa rate ranked below the 25th percentile of the historical rate levels, which is two and a half times of the values during the months with a high relative Baa rate ranking (4,290 million$ for the 4th quartile). The results controlled using the S&P 500 index MTBV ratio showed a similar pattern. Due to the correlation between the stock market and the debt market, no low relative rate occurred when the MTBV ratios were high. In general, the average monthly debt issue values tended to be high when the relative rate ranks were low and the economic growth indicators were high, despite the attractive environment of the equity market.

In summary, it was found that there was an apparent tendency for corporate debt issues to be determined by the relative interest rate when compared to the historical

levels. There were significant differences in issue numbers and volumes across the various relative interest rate levels. More debt was issued at the time when the current interest rate was relatively low. This pattern is robust for the benchmark measures of the Baa and G10 rates even after controlling for the effects of economic growth and stock market condition factors. These results support the hypothesis of backward market timing, suggesting that firm managers base their debt issue decisions, to a large extent, on their responses to past market information.

Table 3.7 Debt Issuances and the Historical Levels of Interest Rates

This table presents the corporate debt issues with different interest rate levels compared to the historical levels. The decile 0 includes rates from the lowest rates to rates just below the 10th percentile in the 10 years prior to the issue. The decile 10 refers to rates from the 10th percentile to just below the 20th percentile, and so on. We cumulated the debt issues during the months belonging to different historical yield deciles. Moody's Seasoned Baa Corporate bond yield and the 10-year Treasury bond yield were employed as the proxies for the interest rates. We presented the trends of the average issue amounts, average maturity, effective maturity and callable/puttable fractions across the different deciles. The statistics regarding the effective maturity only cover the period starting from January 1976 subject to the SDC data availability. An investigation of the historical yield deciles based on the 5 years prior to the debt issues was also conducted. The results are qualitatively similar but not reported here.

Historical Yield Decile	Amount Issues Per Month	Number of Issues Per Month	Stated Maturity (Mean)	Stated Maturity (Median)	Effective maturity (Mean)	Effective maturity (Median)	Fraction Callable	Fraction Puttable
Baa								
0	11,248	58	13.91	10.43	11.03	8.60	0.22	0.03
10	8,935	44	13.53	10.39	10.89	8.06	0.23	0.03
20	8,643	44	13.13	10.08	9.33	6.64	0.31	0.04
30	10,049	44	12.91	9.55	8.89	6.58	0.34	0.05
40	9,493	45	11.79	8.91	8.90	6.43	0.25	0.03
50	7,708	36	12.10	9.42	9.04	6.48	0.25	0.05
60	4,659	24	20.41	20.73	11.41	8.96	0.27	0.02
70	3,870	22	20.78	20.14	12.59	10.42	0.27	0.02
80	5,054	23	22.36	23.80	14.01	11.38	0.22	0.02
90	6,817	31	19.55	19.26	12.61	9.81	0.15	0.01
100	4,968	22	18.12	16.78	13.64	11.29	0.16	0.02
G10								
0	12,899	66	13.01	9.81	9.97	7.70	0.24	0.03
10	9,227	45	13.63	10.44	10.41	7.97	0.24	0.03
20	8,107	41	13.26	10.24	10.17	7.40	0.27	0.04
30	8,046	35	12.60	8.76	9.65	6.40	0.27	0.04
40	7,480	34	12.24	9.26	9.66	7.61	0.26	0.04
50	6,824	28	14.07	11.16	10.54	7.49	0.26	0.01
60	5,316	27	19.77	18.49	12.41	9.40	0.40	0.03
70	4,438	24	20.71	20.32	12.00	9.72	0.24	0.03
80	5,562	24	21.72	23.02	12.13	10.26	0.14	0.02
90	5,709	27	19.64	18.97	13.01	10.65	0.20	0.01
100	3,841	19	20.46	20.15	15.04	12.13	0.26	0.02

Table 3.8 Debt Issuances and Historical Levels of Interest Rates with Control of Economic Indicators

This table presents the debt issue amounts (constant $mil in March 2005) with different interest rate levels compared to the historical levels, with the control of economic indicators. Moody's Seasoned Baa Corporate bond yield (Baa) and the 10-year Treasury bond yield (G10) were employed as the proxies for the interest rates. The US Coincident Index (USCI) is the comprehensive indicator of the US economic conditions involving production, employment, income and sales, produced by the Economic Cycle Research Institute (www.businesscycle.com). The market-to-book value ratio of the S&P 500 index was used as the alternative proxy for the economic level. We cumulated the debt issues during the months belonging to the different historical yield quartiles and controlled the USCI and S&P market-to-book value ratios by quartiles. The 1st quartile 1 includes rates from the lowest rates to rates just below the 25th percentile in the 10 years prior to the issue. The 2nd quartile refers to the rates from the 25th percentile to just below the 50th percentile, and so forth. We have only presented the trends of the monthly average issue amounts across the different quartiles of economic level covering the sample period from January 1970 to December 2006. The investigations of the historical yield levels based on monthly issue numbers and different horizons, for example, 5 years prior to the debt issues were also conducted, with the results being qualitatively similar.

USCI

Baa	High	Mid-high	Mid-low	Low	G10	High	Mid-high	Mid-low	Low
1st quartile	10,535	9,577	10,844	9,337	**1st quartile**	10,732	10,550	11,419	10,255
2nd quartile	7,654	9,842	10,822	10,309	**2nd quartile**	7,761	7,942	8,842	3,384
3rd quartile	4,309	5,577	9,912	8,378	**3rd quartile**	5,006	5,862	8,251	3,601
4th quartile	4,290	4,623	4,906	6,498	**4th quartile**	3,621	4,041	4,474	6,695

S&P-MB

Baa	High	Mid-high	Mid-low	Low	G10	High	Mid-high	Mid-low	Low
1st quartile	0	9,479	10,010	11,426	**1st quartile**	0	11,311	10,341	9,484
2nd quartile	0	9,460	7,029	12,480	**2nd quartile**	0	6,841	5,598	12,593
3rd quartile	4,238	3,647	0	10,082	**3rd quartile**	4,671	5,477	0	10,203
4th quartile	4,103	2,332	0	9,559	**4th quartile**	3,993	2,286	0	7,879

3.5.3. Summary

In the section 3.4, it has been noted that contradictory patterns of debt issues emerge when they are examined with the past and the future debt market condition variables respectively, which fails to explain the hypothesis of successful market timing. Therefore it was necessary to test the different forms of market timing. An examination was made of whether managers base their decisions regarding debt issues and maturity structures on the successful anticipation of future variations in interest rates, or on their responses to current market conditions relative to recent historical levels, referred to as forward market timing and backward market timing respectively.

When examining whether managers accurately predict the future debt market variations and adopt corresponding financing strategies for their debt issue decisions, it was found that managers were not successful in this form of forward timing. An examination was made of the differences between the interest rate changes and the conditional interest rate changes weighted by monthly issue volume, maturity and effective maturity respectively, and it was expected that it would be seen that more debt and/or long-term debt was issued before the interest rate rises. The evidence shows that there was no more debt issued prior to positive changes in the interest rate, when the interest rate changes were weighted by the aggregate monthly issue volumes. Although there was some evidence to show that the timing ability regarding debt issues was solely conditional on maturity, this was eliminated when both the issue values and maturities were involved simultaneously. Moreover, the supportive evidence completely disappeared when measured by the effective maturity as the call and put features were considered.

These results concerning forward market timing are consistent with the findings in the preceding section, that is, managers are not successfully timing future interest rate variations. However, strong evidence was found that the debt issue amounts were negatively related to the relative interest rates compared to their historical

levels. The debt issue volume increased as the ranking of the current interest rates declined in contrast to the past. This evidence suggests that the managers of the debt issues were relying heavily on the historical information when making their debt issue decisions. This pattern was robust even when the macroeconomic factors were taken into account.

In summary, the evidence shows that managers are indeed *trying to* time the debt market when issuing their debt, although they generally fail to show any ability to time the market in the forward sense. Their efforts on market timing are explained more convincingly as reactions to the current market variation.

3.6. Maturity structure adjustment and future bond returns

In the previous section, it was seen that firms are generally not successful in timing the future debt market variability. Instead, their debt issue decisions are simply reactions to the current market variation as it relates to previous conditions. This analysis of managerial market timing is focused on long-term corporate debt issues generated from the SDC bond issue database. The market conditions affected not only decisions regarding long-term debt maturity and issue volumes, but also those regarding debt maturity structure, i.e. long or short-term. Baker et al. (2003) examined the variation in the long-term share of total debt issues at the aggregate market level, but the evidence did not reflect managers' timing ability at the firm level. It is of the best interest to examine whether the individual firm changes its debt maturity structure according to the exogenous market conditions. It would be expected that firms change the maturity of their newly issued debt to adjust their overall debt maturity structure, i.e. the percentages of long and short-term debt will change, according to changes in capital costs, if the debt market timing hypothesis holds. Therefore, in this section the changes in firms' debt maturity structures under certain market conditions are explored.

3.6.1. Market timing on future bond returns

The notion that firms time the debt market in order to lower the costs of capital implies there is an incentive to issue long-term debt when such debt is expected to underperform short-term debt, i.e. low excess bond returns, and *vice versa*. Baker et al. (2003) indicated that the proportion of long-term debt in the total debt issues predicts excess bond returns. If this conclusion holds, a shift would be expected between the long and short-term debt at the aggregate market level. Provided that the majority of firms successfully predict high excess bond returns, the level of long-term debt issues would be expected to decline, while the level of short-term debt issues will rise. Conversely, the long-term debt proportion should increase when followed by low excess bond returns. However, since the aggregate

market-level issue volume ma y be determined by some large-size issues, this analysis was conducted at the firm level by giving equal weight to each firm and treating each issue as an individual decision. The proportion of firms with a debt structure of increased long-term debt was employed as the proxy for the long-term share of the total debt issues. To examine whether the timing ability of firms was as assumed above, an investigation was made into the variations in firm numbers with a net increase in long-term debt, referred to as net long-term debt issuers, for each year.

If a firm issued more long-term debt than short-term debt, *i.e.* the percentage of long-term debt in the total debt increases, it was defined as a net long-term debt issuer, otherwise they were short-term debt issuers. According to the definitions of the data items in Compustat and taking into consideration issues of refinancing, the net long-term issues were defined as the changes of long-term debt plus the debt due in one year, while the net short-term issues were defined as notes payable. The annual portfolios of the net long-term debt issuers and net short-term debt issuers were then constructed, based on all the firms available in Compustat for the period 1970 - 2005. The average number of firms available in Compustat was 7,230 with a maximum of 10,165 in 1998 and a minimum of 3,762 in 1971. Since the total number of available firms varied over time, the focus was on the percentages of net issuers rather than the numbers.

The costs of the debt issues were measured by the relative levels of excess bond returns. The sample period was then divided into two sub-periods of 17 years with below median excess bond returns and 17 years with above median excess bond returns. The average annual excess returns of these two sub-periods were positive 12.18% and negative 5.41% respectively. A difference of more than 17% between the two groups is by any means economically large and statistically significant. If firms accurately predict low future excess returns, the percentage of net long-term issuers should be seen to increase.

Table 3.9 shows the results of the above analysis. The average numbers of all the firms with debt issue data available in Compustat was 6,722 and 7,881 for the years with low bond returns and high returns in the subsequent year respectively. The average numbers of net long-term debt issuers with these two portfolios were 3,028 and 3,521 respectively. Although the average of net long-term issuers during the whole sample period was 44.6%, lower than the average of net short-term debt issuers, this percentage remained stable during both the two one-year-ahead portfolios of low excess return years and high excess return years. On average, 44.7% of the firms were net long-term issuers one year ahead of the low excess return years and 44.4% for the years with high excess returns the following year (with a *P*-value of the difference between the two portfolios of 0.792, which is statistically insignificant). No obvious shift was found between the portfolios of the net long-term issuers and the net short-term issuers across the years with significantly different bond returns. Therefore, on average, the firms showed no ability to time the future debt returns on their debt maturity structure.

It is important to know whether certain firms, such as large ones, with specific features exhibit a better ability as regards predicting future market conditions than others. Some studies, for example that of Graham and Harvey (2001), have indicated that managers of larger firms who are expected to be more "sophisticated" are more likely to time their debt issues[62]. Therefore, a comparison was made of the timing ability of larger and smaller firms. Larger and smaller firm portfolios were constructed by classifying all the available firms into only those whose market value of equity was above or below the median for each year. Meanwhile, the book-to-market value ratios which were employed as the measure of growth were also examined. The portfolios of the high and low book-to-market ratio firms were constructed by classifying all the firms into groups with a book-to-market ratio either above or below the median for each year. We then

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[62] Guedes and Opler (1996) documented that firms with different sizes have different preferences regarding their debt maturity. This feature may also affect the debt maturity structure adjustment as the costs of the debt issuance change.

counted the numbers of net long-term debt issuers for each portfolio in the years with subsequent high and low returns. The statistics and comparisons of the firm numbers and percentages based on the above analysis are shown in Table 3.9. First of all, it was found that the average proportion of larger firms among all the net long-term issuers was slightly higher than that of smaller firms for each year of the sample period (52.4% vs. 47.6% for the low return years and 52.3% vs. 47.7% for the high return years). This only suggests that the larger firms issue more long-term debt than the smaller firms do. However, no apparent differences were found between the high and low return years for either the larger firm portfolio or the smaller firm portfolio. The average percentages of each portfolio were almost the same. The *P*-value of the two-tailed mean comparison tests with unequal variances suggested an insignificant difference (0.663 for both tests). Essentially, there was no shift of net long-term issuers from high return years to low return years for either larger firms or smaller firms. Therefore, the larger firms did not exhibit a greater ability to time the debt returns than the smaller firms did. The results of analysing the book-to-market ratio feature show a similar pattern with firm sizes. On average, 50.3% of the high book-to-market ratio firms issued long-term debt when the returns were low in the subsequent year, and this percentage was 50% when the returns were high in the subsequent year (*p*-value 0.711). Not only were firms equally distributed between the net long-term issuer portfolio and the net short-term issuer portfolio across the years that had different levels of returns in the subsequent period, but they also showed no difference of percentage between the high and low book-to-market ratio portfolios. Therefore, there were always about a half of the total firms who made debt issue decisions consistent with the market timing hypothesis no matter what the future levels of bond returns. Besides, there was no relationship between a firm's ability to time future bond returns and the firm size or book-to-market ratio. In conclusion, it was not found that the firms were systematically successful in reducing their capital costs by timing the future debt markets.

Table 3.9 Distribution of Long-term Debt Issuers Corresponding to Subsequent Bond Returns

This table shows the average numbers and proportions of *net long-term debt issuers* during years with different levels of bond returns. The sample covers all firms available in Compustat during the period 1970 - 2005. The sample period was divided into two groups by the median of excess corporate bond returns, referred to as high excess return years and low excess return years. The annual excess corporate bond returns were measured as the compounded monthly return on the long-term corporate bond index over 12 months divided by the compounded monthly return on the T-bill over 12 months, minus one. The returns of corporate bond index are generated from Ibbotson Associates 2006 Yearbook. The corporate bond index is constructed with data from The Wall Street, as described in the Yearbook.
The net long-term issuers were defined as firms issuing more long-term debt than short-term debt, excluding the part for refinancing. In turn, high market value long-term issuers are net long-term issuers with the market value larger than the median market value for each year. High book-to-market value ratio long-term issuers are net long-term issuers with the book-to-market value ratio higher than the median ratio for each year. The annual numbers of net long-term issuers were sorted by years into two portfolios with low returns in the subsequent year and high returns in the subsequent year. The table compares the average numbers and percentages for each of the two portfolios. The *P*-values report the differences of the two groups based on two-tailed mean-comparison tests with unequal variances.

	High excess returns	**Low excess returns**	**p-value**
Years	17	17	
Excess bond returns (%)	12.18	-5.41	0. 000
Average annual firm number	6722	7881	
Net Long-term Issuers	3028	3521	
Percentage	44. 7%	44. 4%	0. 792
High MV Issuers	1592	1846	
Percentage	52. 4%	52. 3%	0. 663
Low MV Issuers	1436	1674	
Percentage	47. 6%	47. 7%	0. 663
High BTMV Issuers	1532	1776	
Percentage	50. 3%	50. 0%	0. 711
Low BTMV Issuers	1496	1745	
Percentage	49. 7%	50. 0%	0. 711

3.6.2. Persistence of timing ability on future bond returns

Continuing the above analysis, an examination was made of whether firms whose debt issues were correctly consistent with the market timing hypothesis were persistently successful in timing future bond returns. Still based on all the firms available in Compustat, portfolios were constructed by classifying firms with debt maturity structure adjustments corresponding to subsequent bond returns.

Assuming that firms are trying to time future bond markets and change their debt maturity structures accordingly, the firms with net long-term (or short-term) debt issues before the year with low (or high) excess bond returns were regarded as correct decision makers, otherwise they were considered as incorrect. There remained the question as to whether the firms in the portfolios of correct issuers did indeed have a superior timing ability as regards debt returns compared to the firms in the portfolios of incorrect issuers, or were they simply guessing correctly about return variations. Therefore, the performance of each portfolio defined as correct issuers and incorrect issuers were examined, in turn, for the subsequent year.

Table 3.10 shows the statistics for the above classifications. Column (a) denotes the percentage of firms whose debt issues were correctly coincident to the future bond returns, while column (b) shows the percentage of firms belonging to the portfolios of incorrect issuers for each year. In general, the percentage of each portfolio in the total sample was around 50% across the years. On average, the percentages of correct issuers and incorrect issuers over the sample period of 34 years were 50.2% and 49.8% respectively (with a *P*-value of 0.822). Columns (c) and (d) show the percentages of correct and incorrect decision makers in the subsequent year conditional on column (a), i.e. the correct issuers one year ahead. Columns (e) and (f) show the percentages of correct and incorrect decision makers in the subsequent year conditional on column (b), i.e. the incorrect issuers one year ahead. It was found that only about half of the correct issuers continued to be correct in their debt maturity structure choices in the subsequent year, while the rest were not correct. Similarly, about half of the incorrect issuers chose the correct debt maturity structure adjustment in the subsequent year. The *P*-values of the two-tailed mean-comparison tests with unequal variances (0.601 and 0.517) suggested insignificant differences between the pairs of portfolios in each test.

Baker et al. (2003) claim that managers can time the future bond returns by

adjusting debt maturity structure of firms because the long-term share of debt issuance variations at the market aggregate level predict the future bond returns. The hypothesis can be explained as, if firms time the debt market to reduce the costs of capital, they tend to issue long-term (short-term) debt when the excess bond returns suggest that long-term debt will underperform (outperform) short-term debt. Based on the assumption that firms change their debt maturity structure according to their prediction of future excess bond returns, no supportive evidence was found in this section that the firms were successfully timing the debt market by adjusting their debt maturity structure. Weighted every debt issue equally, the results suggests that there is no convincing linkage between the variation of debt maturity and managers' ability on timing the debt market. The results are inconsistent with the conclusion in Baker et al (2003). Over the sample period of 34 years, there was no obvious shift between the net issuers of long-term debt and short-term debt across years with different levels of bond returns. Moreover, the proportions of correct issuers and incorrect issuers were equally distributed for all years on average. Furthermore, even the correct issuers did not exhibit a persistent ability to anticipate future bond returns. Only half of them continued to be correct when adjusting their debt maturity structure, as with the incorrect issuers. For individual firm or manager, decisions on debt maturity adjustment to reduce the capital costs corresponding to the future bond returns are actually fair gamble. Therefore, the firms were not systematically successful in timing the debt market.

Table 3.10 Persistence of Timing Ability on Future Bond Returns

This table shows the persistence of timing ability on future bond returns based on all the firms available in Compustat during the period 1971 - 2004*. Assuming that firms are trying to time the future bond market on debt maturity, firms with net long-term (short-term) debt issues before the year with low, i.e. below median (high, i.e. above median) excess bond returns were regarded as correct decision makers, otherwise they are regarded as incorrect. Column (a) denotes the percentage of firms whose debt issues were correctly coincident to the future bond returns, while column (b) shows the percentage of the rest. Columns (c) and (d) show the percentages of correct decision makers and incorrect decision makers in the subsequent year conditional on column (a), i.e. the correct issuers one year ahead. Columns (e) and (f) show the percentages of correct decision makers and incorrect decision makers in the subsequent year conditional on column (b), i.e. the incorrect issuers one year ahead. The *P*-values report the differences of each pair based on the two-tailed mean-comparison tests with unequal variances.

	Correct in this year (a)	**Incorrect in this year** (b)	**Correct in next year** (c)	**Incorrect in next year** (d)	**Correct in next year** (e)	**Incorrect in next year** (f)
1971	43.5%	56.5%	53.8%	46.2%	58.7%	41.3%
1972	42.9%	57.1%	57.4%	42.6%	56.9%	43.1%
1973	46.1%	53.9%	46.6%	53.4%	45.6%	54.4%
1974	51.2%	48.8%	47.4%	52.6%	50.3%	49.7%
1975	59.0%	41.0%	62.4%	37.6%	54.1%	45.9%
1976	40.3%	59.7%	59.2%	40.8%	60.1%	39.9%
1977	44.5%	55.5%	60.4%	39.6%	51.6%	48.4%
1978	45.6%	54.4%	57.2%	42.8%	52.0%	48.0%
1979	42.7%	57.3%	55.7%	44.3%	58.4%	41.6%
1980	42.8%	57.2%	47.0%	53.0%	39.6%	60.4%
1981	58.6%	41.4%	60.4%	39.6%	56.0%	44.0%
1982	44.8%	55.2%	49.8%	50.2%	40.7%	59.3%
1983	57.8%	42.2%	38.6%	61.4%	47.2%	52.8%
1984	56.8%	43.2%	39.3%	60.7%	48.3%	51.7%
1985	56.3%	43.7%	59.4%	40.6%	52.3%	47.7%
1986	43.3%	56.7%	49.9%	50.1%	61.8%	38.2%
1987	41.3%	58.7%	48.5%	51.5%	36.3%	63.7%
1988	58.2%	41.8%	63.4%	36.6%	51.0%	49.0%
1989	40.9%	59.1%	49.6%	50.4%	34.9%	65.1%
1990	58.9%	41.1%	34.8%	65.2%	50.2%	49.8%
1991	59.6%	40.4%	33.8%	66.2%	50.2%	49.8%
1992	57.3%	42.7%	62.0%	38.0%	51.0%	49.0%
1993	45.7%	54.3%	45.5%	54.5%	45.8%	54.2%
1994	52.6%	47.4%	48.9%	51.1%	56.8%	43.2%
1995	49.4%	50.6%	44.1%	55.9%	54.7%	45.3%
1996	52.7%	47.3%	51.7%	48.3%	42.5%	57.5%
1997	51.6%	48.4%	44.6%	55.4%	59.1%	40.9%
1998	51.1%	48.9%	43.1%	56.9%	59.4%	40.6%
1999	50.3%	49.7%	52.2%	47.8%	47.2%	52.8%
2000	55.6%	44.4%	40.7%	59.3%	49.1%	50.9%
2001	56.3%	43.7%	58.5%	41.5%	53.4%	46.6%
2002	44.8%	55.2%	44.1%	55.9%	45.4%	54.6%
2003	53.3%	46.7%	57.0%	43.0%	49.1%	50.9%
2004	50.3%	49.7%	50.7%	49.3%	48.6%	51.4%
Average	50.2%	49.8%	50.5%	49.5%	50.5%	49.5%
p-value	0.822		0.601		0.517	

* Due to the analysis of one-year forward based on Table 3.9, the each end of the sample period (1970 and 2005) is cut off.

3.7. Conclusion

Baker et al. (2003) found that, at the market aggregate level, the long-term proportion of corporate debt issues is determined by debt market conditions and can predict future excess bond returns. The evidence that corporate debt maturity is associated with debt market conditions extends the stylised facts about corporate finance[63]. This chapter has examined whether managers can *successfully* time the debt market or whether they are only *trying* to time the market. The question arises from the debate about whether the empirical evidence[64] that corporate debt issues are correlated to the debt market condition factors reveals the underlying market timing behaviour. The existence of a causal link between them was examined by distinguishing the predictions of the future market and the responses to past information. It was found that, in the sense of timing future market fluctuations, the firms were generally unsuccessful, while their debt issue decisions heavily depended on past information.

Firstly the out-of-sample tests based on the methodology of Baker et al. (2003) were conducted by directly examining the relationship between the debt maturities and the market variables with the lagged variable in both the forward and backward direction, but it was found that this evidence only captured the contemporary co-variations between the debt issuances and the debt market conditions at the time of the issuance rather than revealing a causal link between these two aspects. The debt maturities and issue volumes were uniformly negatively related to the debt issue costs implied by both the previous and subsequent market conditions and this pattern suggests that the market conditions became desirable for the purpose of corporate debt issuance before the firms adjusted their financing strategies, while the firms' decisions regarding their debt issues were not consistent with the desirable subsequent market environment. Put differently, firms can only raise debt funds after the capital costs decline but they failed to issue their debt before the costs went up. The results appear to be attributable to the managers' reactions to the current variations in the debt market

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[63] Many previous empirical studies (see section 2.2), for example, Brick and Ravid (1985), Barclay and Smith (1995), and Stohs and Mauer (1996), found a relationship between debt issues and market variables, which suggests there are managerial market timing behaviours.

[64] The recent hot debate in the literature is between "genuine market timing", such as argued by Baker et al. (2000, 2002, 2003, 2006) and "pseudo market timing", such as argued by Schultz (2003), Butler et al. (2005, 2006) and about the relationship between corporate debt issuance and debt market variations.

conditions rather than to accurate predictions of future market movements. This evidence is consistent with "pseudo market timing" as suggested by Butler et al (2006). Thus, the co-variations between the time series of the debt issues and the market variables existed in the *ex post* tests but were not predictable *ex ante*, while the managers were not systematically successful in timing the debt market when making decisions regarding their debt issues.

Furthermore, the debt issuances were examined with respect to the previous interest rate variations and future rate fluctuations separately which reflect the responses to past information and predictions of the future market, referred to as backward timing and forward timing respectively. On the one hand, an investigation was made into whether the interest rates or spreads tended to rise after the firms had issued their debt. On the other hand, an examination was made of whether the debt issuances were affected by the current level of interest rates at the time of issuance relative to the historical rates. The results revealed that the firms did not appear to issue more debt prior to the increasing interest rates nor did they issue more long maturity debt prior to the increased cost of long-term debt implied by the market conditions. However, it was found that the levels of aggregate debt issues pronouncedly increased with the decline of the relative interest rates compared to their recent historical levels. Therefore, the overall results of this study are consistent with the findings of the survey undertaken by Graham and Harvey (2001) that corporate managers tend to issue debt when interest rates are particularly low when compared to previous levels. However, the results do not support the assumption that managers accurately predict future interest rate changes and issue their debt accordingly, with the motivation of forward timing the market. These results question the underlying meaning of market timing, as previous studies have failed to clarify the definition. If "timing" means that managers make use of available information to accurately predict future market movements and adopt correct financing policies accordingly, referred to as "successful market timing", the results do not support this notion. However, if "timing" implies that managers try to make choices regarding their debt issues in order to reduce the costs based on their responses to market variations, the findings are supportive.

Baker et al. (2003) found that, at the market aggregate level, the increased percentage of long-term debt over total debt issues predicts low future bond returns. However, this does not suggest that firms are successfully timing the debt market. The present chapter examined the firm-level debt maturity structure choices across different levels of capital costs measured by bond market returns. The difference here is that the debt maturity structure of each firm weighted equally was measured, rather than the aggregate debt volumes, to more reasonably examine the firms' decisions regarding debt maturity. However, it was found that the percentage of firms changing their debt structure by issuing long-term or short-term debt were very stable no matter with the levels of bond returns afterwards. Moreover, the proportion of firms that seemed to successfully predict the future market variations were not higher than the proportion of the rest. This pattern was robust even when all the firms were classified by firm size or book-to-market ratios. Furthermore, the firms that made correct choices regarding their debt maturity structure adjustment did not persistently exhibit a higher timing ability in the following period than the rest of the firms over the whole market. All in all, it was not found that the corporate managers possessed informational advantages or superior abilities as regards timing the debt market over the rest of the market participants. They had only a half chance to correctly bet the future debt market movements as suggested by the efficient market hypothesis.

Market timing refers to managers' actions in capitalizing on temporary mispricing. More specifically, it is the issuing of overvalued securities and repurchasing of undervalued securities. Despite the usual challenges, financial economists as well as practitioners have never given up exploring mispricing using various techniques. The growing field of behavioural corporate finance suggests an increasing popularity in the stylised behaviour involved in managerial decisions. The theoretical framework of behavioural corporate finance separates the literature into two approaches: irrational investors (the inefficient market) or irrational managers. The irrational investor approach hypothesizes that securities can be temporarily more or less mispriced and then the security market is arbitrageable, while rational managers are assumed to capture the arbitrage opportunities in their financing decisions. Another approach regarding irrational managers assumes the behavioural bias of managers under efficient market conditions. Managers try to

time the security market but are generally unsuccessful because either the market is generally efficient or the managers are not rational in their belief in their "superior" ability, as compared to outside investors, to capture mispricing information. The empirical evidence does not support the assumption that managers perceive arbitrage opportunities of security mispricing. As corporate debt issuance is a two-sided proposition at the market level, it is inevitable that a game is played between the managers and outside investors regarding market information. There is no reason to assume that managers possess informational advantages at the market level, especially in the bond market which is more transparent and less asymmetric in information. In general, there is still an issue as to whether investors or managers are fully rational, while the fundamental questions raised here are: (1) if firms benefit from managers' successful market timing, why? And alternatively, (2) if they do not, why does market timing play such an important role in the financial decisions of firms? These questions call for a fundamental improvement in the traditional financial theory framework. Before this can be done, it is necessary to examine the current financial theories by including the market timing issue as a behavioural factor. The following empirical chapter is dedicated to this objective.

Chapter 4: Corporate debt issuance in the hot market and its capital structure implications

4.1. Introduction

4.1.1. Financing decisions and market timing

A firm's financing policy is one of the most important decisions facing the manager in need of capital for new investment opportunities. Which particular financing instrument is selected and how much new funding is raised are general questions to be considered. It has been shown empirically that firms' financing decisions do not simply follow any one traditional theory of capital structure[65], such as the trade-off theory, pecking order theory or free cash flow theory[66]. In practice, market timing tends to be an important aspect of real corporate financing policy[67]. Referred to as the implementation of financing strategy based on capital market conditions, the market timing hypothesis offers a behavioural explanation for managers' incentives when issuing securities, as a supplementation and modification of traditional theories of capital structure.

Although most existing studies have focused on equity market timing[68], which refers to "the practice of issuing equity at high prices and repurchasing at low prices" (Baker and Wurgler (2002), p.1), debt market timing has drawn more attention in recent years (e.g. Baker et al. (2003), Faulkender (2005), Butler et al. (2006), Alti (2006)). The theory of debt market timing should answer three questions: (1) are firms timing the market for when they issue debt? (2) Are such timing activities effective? And (3) what are the motivations underlying debt market timing? Answers have been given to the first question by the evidence of at

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[65] As indicated by Myers (2001), "there is no universal theory of the debt-equity choice and no reason to expect one" (p.81).

[66] Refer to the literature review in Section 3.2.1. For the reason of brevity, not be repeated here.

[67] Market timing hypothesis is developed from the evidence of market over- or undervaluation, and evolves an emerging theory of capital structure. For example, Jung Kim and Stulz (1996) indicate the motivation of market timing may determine firms' debt-equity choice, and compare it with the pecking-order model, the agency model. Baker and Wurgler (2002) indicate that capital structure is the cumulative outcome of firm's historical efforts of market timing, which is referred to as market timing theory of capital structure. They argue that traditional theories of capital structure are hard to explain the variation of capital structure with market valuations.

[68] For example, Taggat (1977), Marsh (1982), Asquith and Mullins (1986), Jung Kim and Stulz (1996) and Eckbo, Masulis and Norli (2000) on seasoned equity issues, Ritter (1991), Loughran, Ritter and Rydqvist (1994), and Ibbotson, Sindelar and Ritter (1988, 1994) on initial public offerings.

least three different types of study about debt market timing. Firstly, the direct time-series analysis shows that, at the aggregate market level, a firm's debt issue activities are significantly correlated to variations in the debt market environment, although it is arguable as to whether this correlation is cause-effective or spurious (e.g. Baker and Wurgler (2003)). Secondly, empirical studies based on individual debt issue data indicate that the implementation of firms' debt issue decisions, such as maturity structures and yield types, are tied to the predictability of corresponding debt market factors (e.g. Faulkender (2005)). Thirdly, and perhaps more straightforwardly, some survey studies (for example, Graham and Harvey (2001)) have revealed that the majority of financial managers implement financing policies with the strong motivation of market timing. Managers admit they prefer short-term debt "when short-term interest rates are low compared to long-term rates" (p.223).

The above evidence is more suggestive of the interpretation that managers are *trying* to time the market for their debt issuances. Unfortunately, there is little evidence that firms successfully time their debt issuances. From the implication of assets pricing, there is a significant difference between debt market timing and equity market timing. Stock prices are determined by expected future cash flows and firm-specific rates of returns, so the asymmetric information leads to a divergence of opinions about variations in the individual stock or the overall equity market. There is rich literature that documents the tendency of firms to time the equity market by issuing shares when managers believe that their firm's stocks are overvalued[69]. Debt market timing is attributable to the incentive of reducing the costs of capital, if managers believe it is possible. However, compared to the over or under-valued equity market, debt is less likely to be mispriced as a two-sided proposition based on the market-level public information[70]. Although managers may believe the credit rates of their own firms are being misjudged and make use of the arbitrage opportunities before they are realized by the overall market, there is no reason to assume that they, on average, possess informational advantages regarding forecasting debt market condition variations over the other market

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[69] Among others, Ibbotson, Sindelar and Ritter (1988, 1994) found evidence that the equity issue volumes vary accompanying the market price anomalies of IPOs. Baker and Wurgler (2000) documented that the share of equity over the total new issues predicts market returns.

[70] For this reason, Baker et al. (2003) admitted that debt market timing *per se* is impossible.

participants or their counterparts of corporate debt issuers, most of whom are professional institutes, such as commercial banks, insurance companies, and pension fund managers (Butler et al. (2006)). As opposed to equity market timing, which is mutually determined by both managers and investors, debt market timing is more likely to be determined by the unilateral actions of the firm. Therefore, the field of debt market timing offers a better chance to examine corporate behavioural finance.

As debt market timing *per se* is less possible, a potential explanation of systematic debt market timing is the fluctuations in the equity market. Many studies regarding firms' debt-equity choices have found close links between the variations in equity and the debt markets (e.g. Speiss and Afflect-Gtaves (1999), Richardson and Sloan (2003), and Baker and Wurgler (2002)). The undervaluation of equity markets or individual stocks makes debt issues more desirable. However, another potential reason for market timing activities for corporate debt issues is more likely due to managers' irrationality or bounded rationality. Baker, Ruback and Wurgler (2004) categorized market timing into the two approaches of the irrational investor and the irrational manager who may mutually react to equity market timing. The irrational manager approach suggests that corporate managers may be overconfident regarding their timing ability shown as individual investors in the equity market. Their implementation of financial policies may be affected by the debt issue activities of other companies. As a result, this "follow-up" behaviour of debt issuing leads to the "hot market", which in turn stimulates firms to be bolder about their debt issues until the underlying high costs are realized by the majority of issuers. If such is the case, the timing activities of cost reduction are actually driven by the "herd effect", and therefore the "hot debt market" is not only the consequence but also the cause of debt market timing[71]. That firms' market timing activities are determined by the extent to which the market is hot suggests the irrationality of managers' timing activities. This causal relationship cannot be explained by the time-invariant model which relates the debt issue variables to state factors of market conditions. To reveal the evidence of firms' market timing, it is necessary to explore their abnormal financing activities that correspond to

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[71] Chapter 3 of the present thesis reveals that debt market timing is more likely to be the passive response of debt issuers to the current market variation rather than the consequence of successful predictions of future market conditions.

market anomalies. However, there is little literature examining the irrationality of managers when timing the market.

4.1.2. The determinant of capital structure

Regardless of the reasons for debt market timing, the majority of the empirical evidence mentioned above is consistently supportive of the existence of timing attempts[72]. The concern here is with the corresponding question regarding the effects of firms' debt market timing on firm characteristics. Specifically, a firm's financing decisions will directly impact on its capital structure. Presuming that a firm issues more debt than is needed for investment opportunities because the manager considers the low costs of raising capital, the firm may pay more costs for the extra capital if the capital costs are not as low as the manager imagines, and then the overall rate of returns will decline. Meanwhile, the high debt ratio will result in high risks of financial distress and influence future capital issue strategies. Without enough investment opportunity, the firm will possess more free cash than needed. In all, a series of chain reactions will have caused harm to the health of the firm and the impact may be long-term or short-term depending on remedial implementations after the unsuccessful debt issuance. Alti (2006) found evidence that firms time the equity market by issuing extra stocks in hot markets and documented the effects of equity timing on firms' capital structures. However, whether debt market timing follows a similar pattern remains open to question. Furthermore, the concern has also to do with how firms deal with the impacts on their capital structure variations of excess debt issues in hot debt markets, if this is the case. Baker and Wurgler (2002) treated market timing as a new and independent theory of capital structure. They documented that capital structure is the aggregate outcome of the firm's historical attempts to time the market. However, most studies have regarded market timing as an additional factor based on the traditional framework of capital structure[73]. The key issue is whether firms

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[72] However, Jung Kim and Stulz (1996) claimed that they failed to find support for the timing model explaining firms' decisions regarding debt-equity choices in comparison to the pecking-order model and the agency model.

[73] Based on the trade-off hypothesis, Leary and Roberts (2005) argued that the persistent effect of market timing on capital structure is subject to transaction costs. Flannery and Rangan (2006) documented that firms typically close about one-third of the gap between the actual and target debt ratios every year. Alti (2006) found that the firm's capital structure reverses in two years after the deviation caused by equity market timing. On the other hand, Welch (2004) argued that firms do not intend to rebalance their capital structure despite active new issues.

have long-term leverage targets and, if so, how quickly do they adjust toward them after deviations in the capital structure. This is a crucial question, since it asks whether traditional capital structure theories are still explainable when the market timing effect is involved. Unfortunately, the literature is inconsistent as regards both theoretical hypotheses and conclusions.

Market timing has matured to become an important theory of corporate finance in recent years. The market timing literature, covering most aspects of corporate finance, however, leaves a number of gaps. Firstly, the mechanism of debt market timing is not clear, in contrast to that of equity market timing. Various explanations of debt market timing are based on either corporate debt issues *per se* or the impacts of equity market fluctuations. Debt issues *per se* in turn contain the co-reactions of two counterparts, i.e. the market side (the investors) and the issuer side (the firm managers). However, debt market timing is more likely to reflect the biased behaviour of firm managers. Secondly, in the context of capital structure, debt financing obviously affects the firm's leverage in a reverse direction to that of equity financing. The question then is whether the pattern of debt market timing's influence on firms' performance follows that of equity market timing? Thirdly, and most importantly, is market timing simply a supplementary factor of traditional capital structure theories, or is it a new theory explaining financing and investing patterns that are difficult to reconcile with existing theories?

4.1.3. Hot market effect on capital structure

Focusing on the single financial event, corporate debt issues, this chapter follows the above guidelines and empirically examines the evidence and influences of market timing. It directly introduces the "hot market" to measure the issue waves of the debt market, which is simply characterized by debt issue volumes. Although the hot-cold market classification may not capture the full content of market timing, the clustering of debt issuance activities is more likely to be related to the systematic factors affecting firms' timing decisions. An assumption is that debt issuers regard hot markets as windows of opportunities with temporarily low costs of capital, regardless of whether this is real or perceived. Intuitively, issuers will react to the hot market by issuing more debt than they would otherwise do at the

aggregate market level. Conversely, cold market debt issuers are more likely to keep their raised funds to a necessary minimum due to the less favourable market conditions. Therefore, whether the market is hot or cold captures the market timing behaviour, and reflects firms' desires and actual activities regarding debt issues. Among the studies that have examined debt market timing, the overwhelming majority have focused on debt maturity (e.g. Guedes and Opler (1996), Barclay and Smith (1995), Stohs and Mauer (1996)), with a very small proportion investigating debt yields (e.g. Faulkender (2005)). However, debt issue volume has been hitherto ignored in the market timing literature. This study examines the hypothesis of excess debt issuance in the hot debt market and its corresponding influences, if any, on corporate financial characteristics, especially capital structure. Furthermore, it investigates how firms adjust their capital structure in the short and long-term when the debt ratios apparently deviate from normal levels due to market timing activities. Therefore, this study contributes new evidence of debt market timing in hot and cold markets from the aspect of debt issue volume. Moreover, it sheds some light on the implication of the market timing hypothesis for traditional capital structure theories.

4.1.4. Results and implications

In general, the main findings of this study are as follows. Firstly, hot markets capture the timing behaviour regarding corporate debt issuance. The hot market effect on corporate debt issue activities is substantial. The pre-issue leverage of hot market issuers, on average, is similar to that of cold market issuers. However, since the average percentage of debt issue value over total assets of "hot market" debt issuers is significantly higher than that of "cold market" debt issuers, the post-issue leverages of "hot market" issuers are significantly higher than those of "cold market" issuers. The results show that the higher debt issue ratios of hot market firms are induced by neither large debt capacity nor faster growth. On the contrary, hot market firms are not more profitable than cold market firms. Moreover, less retained earnings and more dividend payments suggest hot market firms do not have better or more investment opportunities, with more debt funds being raised. Furthermore, although no significant difference of cash was found between hot and cold market firms, the lower investment ratios of hot market firms suggest the

additional cash from the excess debt funds is cancelled out by the extra costs of the debt issues. Obviously, hot market issuers raise more debt funds than the minimum needs of investment opportunities.

Secondly, in contradiction of the results in Alti (2006), which found quick reverses of capital structure after IPOs, this chapter found that the hot debt market effect has a long-term persistent influence on firms' capital structures. While leverage ratios increase substantially after the time of the debt issue for both hot and cold market firms, the increase is significantly larger for hot market issuers. Although hot market issuers raise more debt funds which in turn lead to higher leverage, they do not tend to reverse their capital structure by reducing their debt issues or increasing equity issues, and as a result, the hot market effect persistently lasts for longer than five years after the hot debt issues. Inconsistent with the trade-off theory of capital structure, the results suggest a *market-oriented pecking order* theory modified by a behavioural factor. Debt market timing plays an important role in shaping financing activity and results in a long-term deviation of the capital structure from the certain target. Therefore, the results are in line with the view of Baker and Wurgler (2002) that capital structure is the cumulative outcome of historical market timing.

Finally, the pattern of debt market timing where firms issue excess debt in hot markets is robust regardless of the hot market definition. It is also consistent across the structural break in the debt market. The hot market effect is persistent in the long term after considering various factors. However, the only exception is that it disappears quickly when the debt issues are small.

The remainder of this chapter is organized as follows. Section 4.2 reviews the previous research on market timing. Section 4.3 describes the data and the hot market definition. Section 4.4 empirically analyses the short-term impacts of debt market timing in the hot market and the underlying reasons for it. Section 4.5 examines the long-term influence of the hot market effect on firms' capital structures. Section 4.6 reports the robustness checks, and Section 4.7 provides the conclusions.

4.2. A review of literature

Market timing plays an important role in firms' financing activities and in shaping their capital structures. Evidence for market timing comes from a variety of different sources. This section reviews previous literature regarding market timing in corporate financing policy from several aspects. Firstly, firms' decisions regarding raising capital in specific patterns are affected by the extent to which the capital market is hot. The internal and external determinants may include market overvaluation, manager or investor optimism, industrial innovations, concerns about cost reduction, and growth opportunities, etc. Evidence shows that the hot issue market abnormally affects the issuer's performance in various ways, including capital structure deviation, post-issue stock returns, cash flows, and capital issuances afterwards. However, the overwhelming majority of the literature focuses on the hot equity issue market. In contrast, hot issues in the debt market are far from being explored. Secondly, firms time the debt market from various aspects of debt issuance. A large body of literature has examined market timing on debt maturity structure. Firms' debt maturity structures or the maturities of new debt issues are documented as varying with debt market condition factors. Moreover, firms time the yield types of their newly issued debt as well in order to lower the cost of capital. Another interesting question is whether firms also time debt issue volumes when managers believe it is a good time to borrow in the debt market at low costs. However, the literature has left this question open. Thirdly, the market timing hypothesis has arisen as an emerging theory of capital structure. On the one hand, as outlined by Baker and Wurgler (2002), capital structure is the aggregate outcome of the firm's historical market timing. This hypothesis is more akin to the market-oriented pecking order theory that firms make financing decisions based on the cost of capital implied by the market conditions. On the other hand, contradictory evidence shows that market timing behaviour has only a short-term impact on firms' capital structures. Although financing choices based on capital market conditions at the time of issuing deviate firms' leverage ratios out of the optimal range (if existing), firms tend to rebalance their capital structure sooner or later to an appropriate level. In this sense, the market timing hypothesis is close to

the modified trade-off theory with a specific short-term factor involved. The market timing hypothesis addresses the innovative behavioural factor in the traditional capital structure theories. However, the underlying implications of the market timing hypothesis are not consistent and there remains a gap in the literature regarding capital structure.

4.2.1. The hot issue markets

The literature regarding hot or cold issue markets has mainly focused on equity issues. The hot and cold issue markets were first documented by Ibbotson and Jaffrey (1975) who examined the IPO market during the period 1960-70. The notion of the "hot issue" usually refers to particular stock issues that have risen from their offering prices to higher than the average premia in the aftermarket. Ibbotson et al. (1994) revealed that the stock prices of firms going public in hot issue markets underperformed for five years after the offerings. There is also evidence that the earnings per share of firms going public typically grows rapidly in the years prior to going public, but then actually declines in the first few years after the IPO. Furthermore, this long-run underperformance was concentrated among firms that went public in the heavy volume years. In contrast, there was no evidence of long-run underperformance by those firms that went public in the light volume years. Other empirical studies have also revealed evidence that there is a strong relationship between equity issuance and indicators of equity market overvaluation. For example, Loughran, Ritter and Rydqvist (1994) found that IPO issue volumes are highly correlated to stock market valuations in major markets across the world. As regards individual markets, Pagano, Panetta and Zingales (1998) found that private firms' IPO decisions in the Italian market were determined by the market-to-book ratio of the industries the firms belonged to. In the US, Hovalimian, Opler and Titman (2001) also found seasoned equity issuances were highly associated with stock prices. From a UK sample, Marsh (1982) documented that there was a similar pattern in that firms tended to issue equity with recent stock price appreciation. Apart from stock market overvaluation, hot equity markets have also been described as having an unusually high volume of offerings, severe underpricing, or frequent oversubscription of offerings. Ritter (1984) found that during the 15-month period starting in January 1980, hot issue

markets had average initial returns reaching an astonishing 48% of the IPO prices. He found that, for given specific industries, timing does matter as regards the degree of underperformance of firms going public. Following these hot periods. there tend to be periods of "heavy" volume accompanied by relatively low initial returns and "light" volume. For example, "in 1971 there were 391 offerings with relatively high average initial returns, followed by 562 offerings in 1972 with moderate returns, which in turn were followed by 105 offerings in 1973 with negative returns. In the mid-1970s, there were very few offerings." (Ibbotson et al. (1988), p.37) Hot issue markets exist because there are periods when IPOs can be sold at relatively high price-earnings and market-to-book ratios. This induces a high volume of new issues, and the relatively strong willingness of issuers to sell stocks below the aftermarket prices. Rather than economic and business cycles, this large cycle in volume may represent the response of firms attempting to time the IPOs to take advantage of these swings in investor sentiment. If companies were taking advantage of misevaluations by investors, then poor subsequent performance following high volume periods would be expected.

The IPO literature offers a variety of opinions about why and how hot and cold market firms might differ. These include theoretical models that focus on underpricing as a signalling mechanism, empirical studies on the long-term performance of IPOs, and models of decisions to go public or remain private. The signalling models characterize hot markets as periods when a greater number of high quality firms choose to go public (e.g. Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989)). In these models, firms are drawn into hot markets because offer prices are less affected by adverse selection costs. In sharp contrast, the long-term performance literature argues that hot market firms are lower quality firms because they appear to have worse stock returns than IPOs from cold markets (e.g. Loughran and Ritter (1995) and Field (1997)). This literature tends to view hot markets as the result of wild bullishness on the part of irrational investors, which provides a chance for managers to take advantage of a "window of opportunity" to implement an IPO. More recently, some models of the going public decision have focused on hot markets as being driven by the onset of a technological innovation or positive productivity shock (e.g. Stoughton, Wong and Zechner (2001), Benveniste, Busaba and Wilhelm (2002), and Maksimovic

and Pichler (2001)). In their view, hot markets are characterized by clusters of small, risky IPOs from particular industries. These new businesses have tremendous growth potential, though they may turn out to be not highly profitable. Other models of the decision to go public are also agnostic about quality, including those that focus on the need for a dispersed shareholder base (e.g. Zingales (1995)).

However, the literature is not entirely consistent with the conclusion of substantially distinguishing characteristics between hot and cold issuers. Helwege and Liang (2004) examined how IPOs from hot and cold markets differ and evaluated which of these alternative characterizations of the hot market appears to best fit the data. They found that IPOs in hot (high volume) markets are no more concentrated in particular industries than IPOs in cold markets. Moreover, hot and cold IPO firms do not differ notably in quality, such as profitability, size and sales growth, except that cold market IPOs have more capital expenditures. Furthermore, the poor long-run performance of IPOs is not a unique characteristic of hot market IPOs, but a common phenomenon of both hot and cold market offerings. Therefore, hot issue markets are not primarily driven by the opportunistic behaviour of managers, but attributable to greater investor optimism, which suggests that the more established an issuer is and hence the less investor uncertainty there is about the firm's real value, the lower the amount of underpricing. Leary and Roberts (2005) indicated that firms issue or repurchase debt and equity in clusters subject to external restrictions. On the one hand, the provisions of the SEC regulations restrict the timing and amount of share repurchases on any given day. On the other hand, seasonal factors such as Labor Day and Christmas vacations lead to fewer IPOs brought to market in September and January when they may actually be neutral. A review paper from Baker, Ruback and Wurgler (2004) summarizes the literature that has emphasized the opportunistic timing of new investors in equity issue clustering. This line of study argues that hot issue markets exist because of investor sentiment and external factors rather than the irrationality of managers[74].

Unfortunately, in contrast to the hot equity market, the literature remains silent regarding corporate debt issuance in hot or cold markets and its short and

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[74] For example, Burch, Christie and Nanda (2004) explained the underperformance of hot equity issues as the result of the oppotunitistic timing of new investors. Eckbo, Masulis and Norli (2000) and Eckbo and Norli (2005) argued that the underperformance of IPOs and SEOs is due to them being less risky. Schultz (2003) indicated that "pseudo market timing" can result in underperformance.

long-term effects on debt issuers. As reviewed in the subsequent section, the majority of studies have focused on looking for evidence of debt market timing but ignored the consequences and underlying implications. Moreover, the data on individual debt issues and their subsequent returns does not approach the level of detail of the IPO or SEO data. In fact, debt issues play an equally important role in equity financing during the life of a firm. Moreover, the debt market engages less informational asymmetry in the sense of market efficiency. The abnormal pattern of debt issues in the hot market, if there is one, is better able to reflect firm managers' attempts to and underlying motivations in selecting capital resources rather than the mixture of both sides of the debt issuance. For this reason hot debt issuance should draw particular attention from the literature on market timing.

4.2.2. Market timing on corporate debt issuance

Although most of the existing studies have examined the ability of managers to time equity issues, recent evidence suggests that managers also time their debt issues (e.g. Baker et al (2003), Graham and Harvey (2001), Faulkender (2005)). In contrast to the relatively few executives that time the changes in their credit rating, about which they might reasonably have private information, managers surprisingly attempt to time the debt market regarding public information. Firms' decisions regarding debt issuance involve considerations of several aspects, such as maturity structures, yield types and issue volume. First of all, debt maturity choice has been an important aspect noted in the literature regarding market timing. Among others, Guedes and Opler (1996) examined the debt maturity decisions of a sample of over 7,000 debt issues. They found that debt maturities were strongly negatively related to the term spread, which was fluctuating considerably during this sample period. But they left the question open as to whether the inverse relation indicates that market participants naively attempt to "ride the yield curve" or are rationally responding to a market that sometimes systematically misprices bonds in part of the yield curve. Barclay and Smith (1995) documented a similar effect at the level of the aggregate balance sheet data rather than new issue data, that is, the average maturity of a firm's combined outstanding debt is negatively related to the term spread. Direct evidence from the Graham and Harvey (2001) survey study revealed that managers time their debt maturity choices based on the

level of the interest rates. Managers issue short-term debt when they feel that short-term rates are low relative to long-term rates. Baker, Greenwood and Wurgler (2003) found evidence that, in the aggregate data, managers were able to engage in the successful forward-looking timing of fluctuations in the yield curve by making judicious choices of the maturity structure of their firms' debt. More interestingly, they found a negative correlation between future excess long-term bond returns and the ratio of long-term debt issues to total debt. This is interpreted as evidence that managers successfully predict future excess long-term bond returns and make corresponding choices regarding their debt issues so as to reduce their overall costs of debt. However, in their study testing the primary theories of debt maturity structure, including the agency cost hypothesis, the signalling and liquidity risk hypothesis, the maturity matching hypothesis, and the tax hypothesis, Stohs and Mauer (1996) comprehensively examined the determinants of corporate debt maturity structure. However, they found no evidence that firms time their debt maturity structures in response to the shape of the term spread.

Firms' debt market timing also appears to influence their decisions on yield type choices when issuing new debt, although there have been few studies focusing on this issue. Based on a dataset of the chemical industry in the US, Faulkender (2005) investigated whether firms were hedging or timing the market when selecting the interest rate exposure of their new debt issuance. Inconsistent with the standard textbook prescription of interest rate risk management, or the matching hypothesis that firms should match the risk exposure of their debt to that of their assets, this study documented that the final interest rate exposure of newly issued debt was largely driven by the slope of the yield curve at the time the debt was issued. These results suggest that interest rate risk management practices are primarily driven by market timing rather than hedging considerations. Antoniou et al. (2006) found similar evidence for the overall UK market. Their results show that both debt maturity and risk exposure are driven by the debt market conditions rather than firm-specific interest rate risk exposure. When the long-term rates are relatively low compared to the short-term rates, firms tend to issue fixed rate debt to lock in the interest rate risk exposure. If managers predict that long-term rates will decline in the future, floating rate debt is preferable. Therefore, not only debt maturity but also yield types are an important timing factor considered to lower the capital costs

when issuing new debt.

It is reasonable to question whether managers also time debt issue volume. In other words, if managers believe the current costs are low at the time of the debt issues, do they borrow more than is necessary for their capital needs? Previous literature has paid little attention to market timing as regards issue volume with the exception of Alti (2006), which, however, identified the capital structure implication of market timing by focusing on IPOs. He found that firms issue substantially more equity when going public when the equity market is hot. Moreover, the additional equity hot-market firm's issue mainly adds to their cash balance rather than investment necessity. Accordingly, their investment ratio and profitability are significantly lower than those of firms who do not time the market and only raise capital at a necessary minimum. Unlike other studies (e.g. Baker and Wurgler (2002)) identifying market timers as those firms that have a history of raising capital at high market-to-book ratios, the measure of timing in Alti (2006) is based on the aggregate market IPO issue volume because it is not closely tied to other determinants of financing policy and therefore contemporaneous controls of firm characteristics will not be noisy proxies. Alti (2006) indicated that this measure of market timing can effectively avoid a spurious relationship between firm history and capital structure in analysing the long-term effects of market timing. This study focused on the IPO market since the author argued that going public is the most important single financing event in the life of a public firm. Therefore, the payoff from correctly timing the IPO, either real or perceived, is potentially quite high. Moreover, investors face more uncertainty and a higher degree of asymmetric information when valuing IPO firms than they face in the case of mature public companies. If the IPO sample is likely to be highly revealing of pure market timing motives, it is reasonable to think there may be interest in the timing motives of debt issues as well. However, in contrast to the studies examining equity financing patterns, the literature on debt financing patterns is underdeveloped. If firms tend to issue more equity than necessary in hot markets, it may be presumed that they would also do so when debt financing, where several factors may potentially influence managers' decisions. For example, a manager may reasonably have less informational advantage regarding the firm's debt performance and debt market variations when issuing debt than when issuing

equity. Moreover, equity issuance lowers the leverage ratio and therefore managers may worry little about financial distress risks caused by large debt issues. However, it remains an open question as to whether firms time their debt issue volume.

Most studies have not focused on debt market timing independently but have linked it to the impact of equity markets. The potential explanations for debt market timing can be categorized as three strands. The first focuses on the interrelationship of valuation in the debt and equity markets. Equity overvaluation would be expected to lower the cost of debt directly, so the relationship with subsequent stock returns may reflect debt market timing. One intriguing pattern that has been uncovered is that debt issues are followed by low equity returns (e.g. Richardson and Sloan (2003)). Speiss and Affleck-Graves (1999) examined 392 straight debt issues and 400 convertible issues during the period 1975 - 1989. The shares of the straight debt issuers underperformed a size and book-to-market benchmark by an insignificant 14% over five years, while the convertible issuers underperformed by a significant 37%. This suggests that if the equity did so poorly, the debt issues presumably did also. Antoniou, Guney and Paudyal (2006) documented that UK and German firms issued long-term debt when the equity premium was high, reflecting managers' attempts to minimise the cost of capital by making choices between the sources of funding. The second strand of study has examined debt market timing from the behavioural perspective. Managers may tend to be more optimistic when capital is cheap, and thus raise and invest as much as they can from any sources including debt funds. This theory combines the notions of investor and managerial irrationality, and suggests that managerial and investor sentiment is correlated. Debt market timing and equity market timing differ in important respects. Butler, Grullon and Weston (2006) indicated that debt pricing depends on the term structure of the interest rates and therefore is driven by publicly available information. It would be surprising if firm managers possessed an informational advantage regarding future interest rates over the purchasers of debt, most of whom are professional investors. Since debt is always correctly priced in this setting, debt market timing *per se* is not possible. Therefore, debt market timing does in fact involves manager irrationality. Their evidence shows that managers cannot be systematically successful in debt market timing. The third strand of study explains timing from the perspective of the internal characteristics

of firms. As outlined in Baker and Wurgler (2003), equity overvaluation relaxes the binding leverage constraint, creating debt capacity that subsequently gets used up by managers in raising debt funds to benefit ongoing shareholders. In this case, debt market timing has nothing to do with debt market valuations *per se*, but is the outcome of equity market timing.

In contrast to equity market timing, the question of debt market timing still remains open in many respects, including the co-reactions between market valuations (investor sentiments) and managerial behaviour, and the specific features of corporate debt issues. Additionally, most empirical works have focused on the aggregate market-level data that ignores the preference of issuers with a variety of firm-specific characteristics. This therefore points to a promising path for future work on market timing theory.

4.2.3. Capital structure rebalancing

The empirical literature provides conflicting assessments of how firms adjust their capital structure. Distinguishing among the three main hypotheses, *the trade-off*, *pecking order* and *market timing*, requires knowledge of whether firms have long-term leverage targets and, if so, how quickly they adjust toward them. It is necessary to explain firms' choices of financing decisions under the implications of different capital structure theories. The *pecking order theory* indicates that investments are financed first with internally generated funds, the firm will then issue safe debt if the internal funds prove insufficient, and equity is used only as a last resort. Under this setting, firms have no strong preferences regarding their leverage ratios and no strong inclination to reverse leverage changes caused by financing needs or earnings growth (e.g. Donaldson, 1961, Miller, 1977, Zweibel, 1996, and Myers and Majluf, 1984). The *trade-off theory* suggests that firms tend to optimise their capital structure and find a balance between the tax shield benefits of debt and financial distress costs (e.g. Bradley et al., 1984, Long and Malitz, 1985, Titman and Wessels, 1988, and Rajan and Zingales, 1995). Therefore, if their leverage ratios diverge from the optimal capital structure (relatively too high or too low), firms will rebalance the capital structure back to the target range. Fisher, Heinkel and Zechner (1989) developed a dynamic trade-off model as a function of

firm-specific characteristics. Due to the presence of recapitalization costs, a firm's optimal debt ratio can vary widely. In their dynamic model, firms can recapitalize at any point in time and the critical upper and lower financial leverage ratios at which transactions costs are incurred to rebalance the firm's financial structure.

Fama and French (2002) tested these two competing models (the trade-off and pecking order) of financing decisions, by examining predictions about long-term leverage and the dividend payout with the main driving variables of profitability and investment opportunities. They identified one "scar" on the trade-off model (the negative relationship between leverage and profitability), one "deep wound" in the pecking order model (the large equity issues of small low-leverage growth firms", and one area of conflict (the mean reversion of leverage)[75]. However, they did not conclude the results of the comparison between these two capital structure theories, and thus left room for further study.

Market timing theory provides two conflicting versions regarding the implications for capital structure. The first version, as explained by Baker and Wurgler (2002), claims that firms issue relatively overvalued securities, which can be either debt or equity. Under this setting, firms do not have a special preference for debt-equity choices in general, but depend on the capital market valuations at the time of the issuance, while the security issue choice is not influenced by previous issue activities. Therefore, this study examined the question of whether market timing has a short or long-term impact on capital structure, and documented that the historical effects of time equity issuances with high market valuations have a persistent impact on corporate capital structures. As a result, capital structures are the cumulative outcome of historical market timing efforts, i.e. the raising of funds when the market valuations were high, rather than the result of a dynamic optimising strategy. In this sense, this version of the market timing hypothesis is more like a market-oriented *pecking order theory*, which implies that firms' financing choices depend on the costs of capital but show no special preferences. Some other studies have provided supportive evidence of persistent impacts of market timing on capital structure. Welch (2004) found that equity price shocks also have a long-lasting effect on corporate capital structures. Welch argued that

[75] Their evidence showed that the firms' debt ratios adjusted slowly toward their target (7-17% per year). That is, the firms appeared to take a long time to return their leverage to the long-run mean or optimal level.

despite fairly active net issuing activity, firms fail to rebalance their capital structures in response to shocks of the market value. He therefore concluded that stock returns are the primary determinant of capital structure changes and that corporate motives for net issuing activity are "largely a mystery". These findings share the common theme that shocks to corporate capital structures have a persistent effect on leverage, which can be interpreted as evidence against the notion that firms rebalance their capital structures toward an optimum.

The second version of market timing theory contradicts the above under the setting of capital structure rebalance. Flannery and Rangan (2006) developed a partial adjustment model of firm leverage and indicated that firms do have target capital structures. The evidence is equally strong across size classes and time periods, and target behaviour is evident in both the market-valued and book-valued leverage measures. Firms that under or overleveraged due to timing the capital markets soon adjusted their debt ratios to offset the observed gap. Firms typically closed about one-third of the gap between the actual and target debt ratios each year. Leary and Roberts (2005) argued that the persistence revealed by Baker and Wurgler (2002) and Welch (2004) is more likely to be due to adjustment costs, rather than indifference toward capital structure. If the costs of such adjustments outweigh the benefits, firms will wait to recapitalize, which results in extended excursions away from their targets. However, the presence of adjustment costs does not determine the firm's capital structure in the long run. The empirical analyses show that even the effect on leverage of a large positive (negative) equity shock is erased within the two to four years subsequent to the shock of debt issuance (retirements). They found that the motivations behind the corporate financing decisions were consistent with a dynamic rebalancing of leverage. Specifically, firms are more likely to increase (decrease) their leverage if it is relatively low (high) due to past financing decisions. Alti (2006) found that, after timing the IPO by issuing excess equity in a hot market, the firms tended to reverse their low leverage ratios by issuing debt during the two to three years of the post-IPO periods until they reached a range of reasonable levels. All of the above evidence is consistent with the survey evidence of Graham and Harvey (2001), which shows that 71% of responses in their sample chose to have a target range for their leverage ratio and a further 10% indicated that they had a "strict" target debt ratio, as indicated in the modified *trade-off theory*, in

which market timing is only a dynamic factor with a short-term impact on capital structure.

The evidence is mixed regarding the implications of the market timing hypothesis for capital structure theories. Moreover, debt market timing has a reverse impact on firms' capital structures in contrast to equity timing and therefore leads to more risks of financial distress, and as it is not yet known whether they follow similar patterns of implementation processes and corresponding consequences this creates a strong motivation for further study.

4.3. Data

4.3.1. Data description and summary of statistics

The initial sample consisted of all new, non-convertible, public bond issues for the period 1st January 1970 - 31st December 2000 in the US market, generated from Thompson Financial SDC new issues database. The data contains information on the issue date, the identity and the characteristics of the borrowers, such as their industry and nationality, and various characteristics of the bond issue, such as the proceeds in nominal dollars. Issues implemented by non-US firms, those outside of the US, and financial firms (SIC code between 6000-6999) were excluded from the sample. If there was more than one debt issued by the same firm in a given month, they were consolidated into one issue, and then the proceeds were cumulated. The observations of debt issues with nominal proceeds in the US market of less than 1 million US dollars were also excluded. The initial sample contained 7,241 observations of corporate debt issues. Furthermore, the sample was restricted to those firms for which COMPUSTAT accounting data was available for the last fiscal year before the debt issue. The accounting data ends with the fiscal year 2005. The firm-year observations that are outliers with regard to various firm characteristics were dropped, with the restrictions described below. Finally, after this screening 6,110 firm-year debt issue observations were retained.

The variables are defined as follows[76]. Book debt, *D*, is defined as the total liabilities (COMPUSTAT item 181) and preferred stock (Item 10, replaced by the redemption value of preferred stock (item 56) if missing) minus deferred taxed (Item 35) and convertible debt (Item 79). Book equity, *E*, refers to the total assets (Item 6) minus the book debt. Book leverage, *D/A*, is then defined as the book debt divided by the total assets. Firm-year observations where the book leverage exceeded 100% were dropped. Market-to-book ratio, *M/B*, is the book debt plus the market equity (common shares outstanding (Item 25) times share price at the end of the fiscal year (Item 199) divided by the total assets). Observations where the *M/B* exceeded 10.0 were dropped.

Table 4.1 summarizes the firms' characteristics and financing decisions. All the

[76] These definitions follow those of Alti (2006), which examined the market timing of hot IPO issues.

variables except *SIZE* are expressed in percentage terms. The analysis was conducted in the event time of the debt issues. The ***issue year*** refers to the fiscal year in which the corporate debt issue took place. The ***issue year*** + ***k*** is the *k*th fiscal year after the debt was issued. The net debt issues, *d/A*, are the changes in the book debt over total assets. The net equity issues, *e/A*, are the changes in the book equity minus the change in retained earnings (Item 36). *RE/A* is defined as the percentage of the year-end retained earnings over total assets. The profitability is measured by *EBITDA/A*, which is the percentage of earnings before interest, taxes, and depreciation (Item 13) over total assets. Following Alti (2006), *SIZE* is the logarithm of net sales (Item 12) measured in millions of 2001 US dollars. Asset tangibility, *PPE/A*, is defined as net plant, property, and equipment (Item 8). *R&D/A* is research and development expense (Item 46, replaced by zero when missing). In the regression analyses below, a dummy variable *RDD* takes the value of one when Item 46 is missing[77]. *INV/A* denotes capital expenditures (Item 128). *DIV/E* is the common dividends (Item 21) divided by the year-end book equity. *CASH/A* refers to cash and short-term investments (Item 1). The variables *d/A, e/A, RE/A, EBITDA/A, PPE/A, R&D/A, INV/A*, and *CASH/A* are normalized by the fiscal year-end total assets and measured in percentage terms. The firm-year observations for which *d/A, e/A, RE/A, EBITDA/A, INV/A*, or *DIV/E* exceeded 100% in absolute value were dropped from the sample.

The statistics of the financial characteristics variables in Table 4.1 display some patterns, despite an insignificant variation over time in general. The sample size declines from 6,110 to 5,153 year-issue observations during the 6 years from the debt issuance due to the probable bankruptcies or mergers and acquisitions of the issuers. It could be argued that the sample is, to some extent, subject to "survivor bias" because of the exclusion of the "dead" firms who disappeared from the sample over time due to debt issues and high leverage. However, only about 3% of the debt issuers disappeared from the sample per year after the hot debt issues, which is acceptable in a large sample analysis. The mean book-leverage ratios of

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[77] Since the data for the R&D expense was missing for a large proportion of the observations in Compustat, the dummy variable RDD can eliminate the influence of the bias for the sample without R&D data. Following the work of Alti (2006), the dummy took the value of one for missing value, and zero otherwise. In the case that R&D data is available, the dummy variable takes value of zero and does not appear in the regression. Alternatively when R&D data is missing, the dummy variable takes value of one and is employed as a control of R&D to consist the regression.

the total sample vary from 60.08% to 62.11% in the six-year period starting from the pre-issue year. The largest variation in book leverage took place in the debt issue year (1.7%) and remained stable at around 62% afterwards. Accordingly, the new issuance of debt and equity during this period is consistent with the pattern of changes in leverage. In the issue year, the percentage of new debt issuances was 1.71% on average, which is identical to the change in the mean book leverage of the total sample. The new debt issuances in the following years declined sharply. However, they are apparently higher than the new equity issuances in the corresponding years. The retained earnings significantly declined in the debt issue year but remained relatively stable in the subsequent years at the level of 2%. It will be revealed in the following section that this may be attributable to the issuing costs and extra interest rate payments of new debt issues. Meanwhile, this is also associated with the reduction in profitability (EBITDA) after the debt issue year. The firm size somewhat increased with age, whereas the percentage of tangible assets declined during the period of the five years after the debt issues. No obvious variation in the R&D expenses was found. However, an interesting pattern emerged in that, after raising debt funds, which is supposed to be for the objective of meeting the demands of investment opportunities, the investment rate of the debt issuers continued to decrease from 8.83% to 7.16% in five years. By contrast, the increases in dividend payments (4.72% to 6.16%) and cash (3.38% to 3.92%) seem to suggest that the firms were facing the extra capital. The following analysis examines the implications of these findings.

Table 4.1 Summary Statistics of Firm Characteristics and Financing Decisions

This table shows the means and the standard deviations of various firm characteristics during the period around debt issues. The sample of non-financial corporate debt issues was generated from the Thompson SDC Bond Issue database covering the period January 1970 - December 2000. The sample consists of all corporate debt issuers, which have COMPUSTAT information for the pre-issue year. The last year of COMPUSTAT data used is 2005. All variables except ***SIZE*** are in percentage terms. Book Leverage, ***D/A***, is the ratio of the book debt to the total assets. Market-to-book ratio, ***M/B***, denotes the book debt plus the market value of the equity divided by the total assets. Net debt issues, ***d/A***, is the change in the book debt. Net equity issues, ***e/A***, is the change in the book equity minus the retained earnings. The retained earnings are measured by ***RE/A***. Profitability is measured by ***EBITDA/A***, which is earnings before interest, taxes, and depreciation. ***SIZE*** is the logarithm of net sales in millions of 2001 dollars. Asset tangibility, ***PPE/A***, is refers to net plant, property, and equipment. ***R&D/A*** is the research and development expense. ***INV/A*** is capital expenditures. ***DIV/E*** is the common dividends divided by the year-end book equity. ***CASH/A*** denotes cash and short-term investments. The variables ***d/A***, ***e/A***, ***RE/A***, ***EBITDA/A***, ***PPE/A***, ***R&D/A***, ***INV/A***, and ***CASH/A*** are normalized by the fiscal year-end total assets.

Panel A Statistics	N	D/A	M/B	d/A	e/A	RE/A	EBITDA/A	SIZE	PPE/A	R&D/A	INV/A	DIV/E	CASH/A
Pre-issue	6110	60.08	120.08	-	-	2.52	14.26	7.41	56.99	0.90	8.83	4.72	3.48
		[18.26]	[75.42]	-	-	[7.31]	[7.33]	[1.77]	[27.06]	[2.13]	[7.31]	[44.79]	[5.58]
Issue year	6049	61.78	120.83	1.71	0.56	2.16	13.59	7.52	56.33	0.88	8.68	4.92	3.72
		[17.87]	[73.76]	[9.54]	[11.2]	[6.41]	[6.41]	[1.71]	[26.99]	[2.1]	[7.09]	[25.54]	[5.98]
Issue year + 1	5860	62.08	119.76	0.52	0.17	2.07	13.49	7.63	56.26	0.87	8.28	4.75	3.55
		[18.46]	[74.02]	[7.82]	[11.11]	[6.26]	[6.47]	[1.67]	[26.88]	[2.07]	[6.66]	[34.11]	[5.51]
Issue year + 2	5650	62.29	118.38	0.53	-0.11	1.99	13.39	7.72	56.08	0.86	7.84	5.82	3.54
		[19.01]	[78.68]	[7.47]	[11.55]	[6.31]	[6.62]	[1.64]	[26.82]	[2.03]	[5.8]	[33.84]	[5.39]
Issue year + 3	5479	62.42	118.13	0.43	-0.25	1.99	13.39	7.79	55.98	0.86	7.61	4.92	3.62
		[20.41]	[78.63]	[9.17]	[11.77]	[6.44]	[6.7]	[1.62]	[26.75]	[2.08]	[5.45]	[37.97]	[5.33]
Issue year + 4	5309	62.32	118.82	0.17	0.31	2.00	13.48	7.87	55.80	0.86	7.34	5.36	3.84
		[21.3]	[80.89]	[9.54]	[26.03]	[6.5]	[6.39]	[1.61]	[26.71]	[2.04]	[5.21]	[22.73]	[5.58]
Issue year + 5	5153	62.11	120.49	0.27	0.09	1.99	13.29	7.94	55.57	0.87	7.16	6.16	3.92
		[22.2]	[82.07]	[11.28]	[26.9]	[6.65]	[7.89]	[1.6]	[26.7]	[2.11]	[5.04]	[59.25]	[5.61]

Panel B. Correlations	Dt/At	M/B	RE/A	EBITDA/A	SIZE	PPE/A	R&D/A	INV/A	DIV/E
Dt/At	1								
M/B	0.078	1							
RE/A	-0.110	-0.009	1						
EBITDA/A	-0.114	0.366	0.090	1					
SIZE	-0.013	0.213	0.066	0.189	1				
PPE/A	-0.211	-0.365	-0.099	-0.082	-0.252	1			
R&D/A	-0.033	0.373	0.060	0.200	0.264	-0.366	1		
INV/A	-0.057	0.046	0.090	0.076	-0.069	0.289	-0.044	1	
DIV/E	-0.034	-0.025	-0.008	0.006	0.023	0.016	-0.001	0.013	1
CASH/A	0.019	0.236	0.091	0.006	-0.047	-0.324	0.238	0.021	-0.007

4.3.2. Hot issue market definition

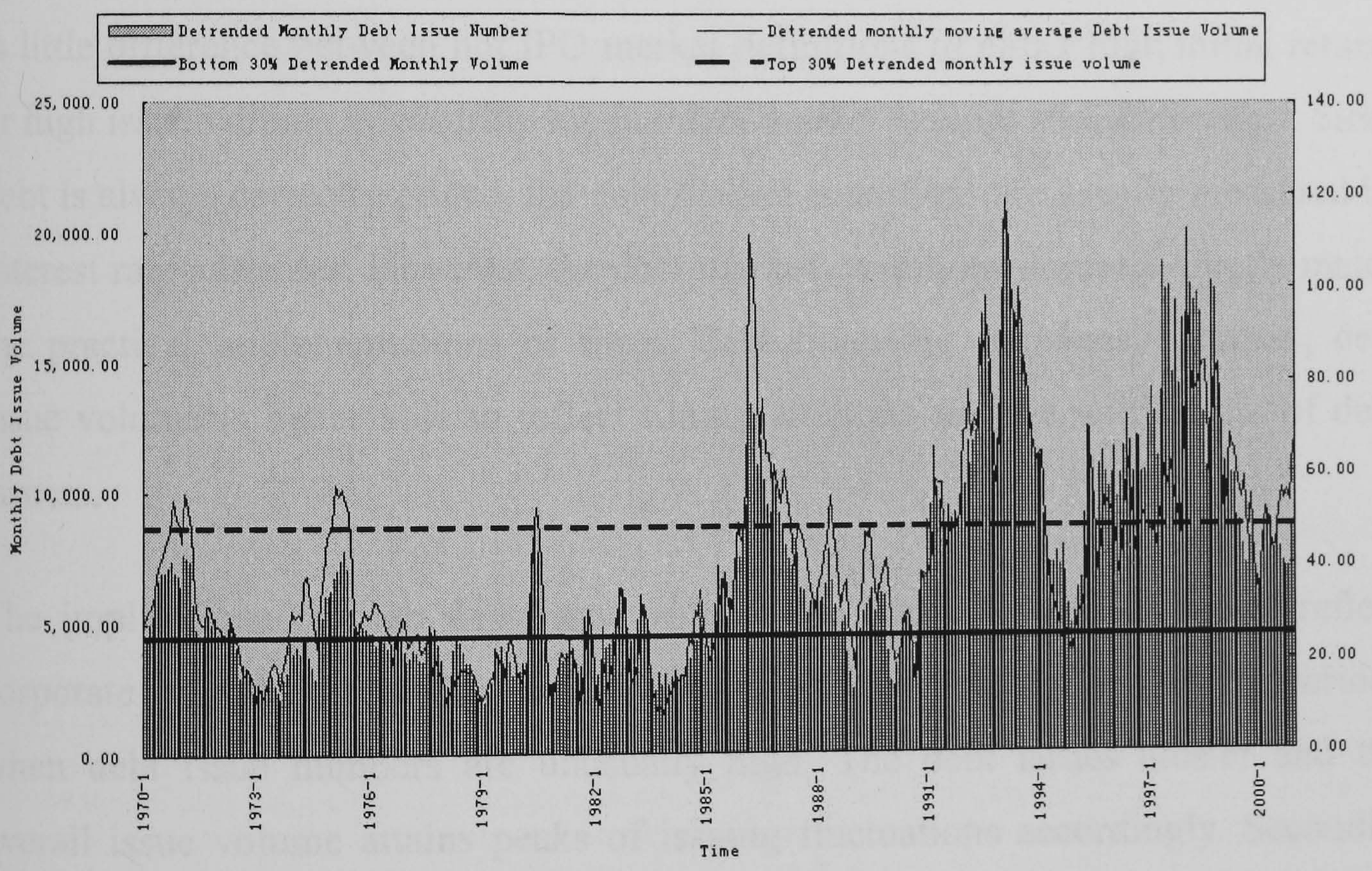
Hot and cold markets are defined on the basis of the monthly debt issue volumes. Specifically, the initial SDC sample before the imposition of the COMPUSTAT data requirements was employed to determine the number and volume of debt issues for each month during the period January 1970 - December 2000. Following Helwege and Liang (2004), and Alti (2006), a three-month centered moving average was taken of the debt issue volume for each month in constant dollars measured as of 1st January 2001 to smooth out any seasonal variations. The advantage of a moving average is that it avoids seasonal reasons for debt issue waves. For example, little debt is typically sold to the market in January and September due to the vacations of Labor Day and Christmas. Using a three-month moving average of debt issue volume avoids categorizing such months as cold. Figure 4.1 plots the detrended monthly moving average corporate debt issue volume for the period 1970 - 2000. After counting the three-month moving average, the maximum monthly issue volume during the sample period was 21 billion 2001 US dollars, and the minimum number was 1.5 billion 2001 US dollars. Hot (cold) months were then defined as those that ranked in the top (bottom) 30% of all the months in the sample with respect to the distribution of the detrended monthly moving average debt issue volume. A dummy variable *HOT* took the value of one for an individual debt issued in a hot month, or zero if the debt was issued in a cold month. The *hot-cold* dummy is the main focus of this study in measuring firms' market timing attempts.

The horizontal solid line represents the bottom 30 percentile ranked by monthly debt issue volume at 4,509 million 2001 dollars, while the horizontal dash line denotes the top 30 percentile at 8,688 million 2001 dollars. As the figure illustrates, the hot and cold months differed substantially in terms of the number of debt issues. Of the whole sample of 6,110 issues, 3,082 occurred in hot months (50.4% of the sample), and 889 issues (14.5% of the whole sample) took place in cold months. Some studies have used the alternative measure of hot and cold markets by monthly deal numbers of debt issues, and this is also plotted in Figure 4.1 as a comparison. Basically, these two measures very closely match each other

numerically (3,227 issues in hot months and 845 in cold months) and graphically (Figure 4.1). Therefore, the hot and cold market is measured as the detrended three-month moving average debt issue volume thereafter in the subsequent analysis. An obvious pattern of corporate debt issues is shown in Figure 4.1 where the issue clusters are denser in the period post-1986 than in the period ex-1986. Therefore, to clarify the dependence of the conclusions on the sample period, two sub-periods split at 1986 were examined separately in the robustness checks.

Figure 4.1 Time Series of the Detrended Monthly Debt Issue Volume

Figure 4.1 plots the accumulated monthly corporate debt issue volumes and deal numbers for the period January 1970 - December 2000 in constant dollars measured as of 1st January 2001. The monthly debt issue volumes and deal numbers are adjusted by a 3-month de-trended moving average to smooth out seasonal variations. The horizontal dash line denotes the top 30% of monthly debt issue volume in constant dollars measured as of 1st January 2001 across the sample period, and the horizontal solid line denotes the bottom 30% of de-trended monthly issue volume in constant dollars measured as of 1st January 2001 across the sample period, which are defined as the hot and cold debt market respectively.



4.4. Hot market effect on firms' financing decisions and capital structures

4.4.1. Market timing measurement by the hot market

The hot and cold issue markets were first documented by Ibbotson and Jaffrey (1975) for the IPO market clusters during the 1960-70 period, with the notion that the initial returns of IPOs between the offering prices and aftermarket prices are unusually higher than the average premia. Hot IPO markets usually come with some related phenomenon, such as an unusually high volume of offerings, severe underpricing, or frequent oversubscription of offerings. Ibbotson et al. (1988) revealed that in hot markets the average high initial returns of new issues are followed by heavy issue volume. Therefore, many studies have measured hot markets directly by characterizing an unusually high issue volume (e.g. Loughran, Ritter and Rydqvist (1994), Leary and Roberts (2005), Alti (2006)). Although there is little difference between hot IPO market definitions of either high initial returns or high issue volume, measuring the hot debt market is more straightforward. Since debt is always correctly priced, the debt market conditions are usually measured by interest rate variables. However, the debt market conditions do not perfectly match the practical implementations of firms' debt financing decisions.[78] Rather, debt issue volume is better able to reflect timing attempts and the willingness of debt issuers.

The implications of high debt issue volume are twofold, both of which reflect corporate debt market timing. Firstly, more firms issue debt during specific periods when debt issue numbers are unusually high. The debt issues cluster and the overall issue volume attains peaks of issuing fluctuations accordingly. Secondly, firms issue more debt during specific periods when the individual debt issue volume is higher than it is supposed to be. As a result, the aggregate market-level debt issue volume is higher than that in the cold market. The hot market effect may result from either one of the above reasons or from the joint effects of both. The hot (cold) market measures in this study are defined as the months when the aggregate debt issue volume is ranked within the top (bottom) 30 percentile during

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[78] In the previous empirical chapter, the evidence shows that firms appear to passively react to the variations in the debt market. Therefore, although debt market condition factors are significantly related to firms' debt issue implementations, the more precise measure of firms' practical timing decisions is the actual debt issuance.

the overall sample period January 1970 - December 2000. Some empirical studies have measured the hot issue market by using monthly issuing numbers (e.g. Leary and Roberts (2005), and Alti (2006)), which are constructed on the basis of the first implication. Critically, the hot market measured by issue volume contains mutual influences of both market timing implications. Moreover, Figure 4.1 shows there is little qualitative and quantitative deviation between these two measures. The first implication of debt market timing is straightforward in measurement, while the subsequent analysis peels off and examines the existence of the second level of market timing.

4.4.2. Hot market effect on financing decisions

All the debt issue observations were grouped and labelled by hot or cold market issues corresponding to the issuing months belonging to the hot or cold months. A dummy variable of *Hot-cold* took the value of one if the debt was a hot market issue, and zero otherwise. First of all, direct comparisons were conducted between hot market issuers and cold market issuers with respect to various financial characteristics prior to the debt issues, with the aim of determining the firms' financing decisions and also to identify the quality of hot and cold issuers as argued by previous studies.

Table 4.2 The Comparisons of Financial Characteristics of Hot and Cold Market Firms

This table compares the mean values of financial characteristics of hot and cold market firms at the end of the year before debt issues. Hot (cold) firms are those firms which issue debt in hot (cold) months defined as ranked in the top (bottom) 30% of all the months in the sample with respect to the distribution of the detrended monthly moving average debt issue volume, shown in Figure 4.1.The variables of financial characteristics include the leverage ratio (*D/A*), market-to-book ratio (*M/B*), retained earnings (*RE/A*), size (*SIZE*), tangible assets (*PPE/A*), R&D expense (*R&D/A*), capital expenditure (*INV/A*), dividend payouts (*DIV/E*), and free cash (*CASH/A*). The variables are standardized by firm assets (except of size, market-to-book ratio and dividend). *T*-values present the differences of one-tail mean comparison tests with unequal variance.

	D/At-1	*M/Bt-1*	*RE/At-1*	*EBITDA/At-1*	*SIZEt-1*
Hot market firms	61.10	130.20	2.41	14.49	7.74
Cold market firms	58.81	95.66	2.81	13.75	6.57
t-value (difference)	[3.40]	[16.29]	[-1.95]	[3.13]	[18.2]

	PPE/At-1	*R&D/At-1*	*INV/At-1*	*DIV/Et-1*	*CASH/At-1*
Hot market firms	53.85	0.97	8.36	4.26	3.41
Cold market firms	65.62	0.62	10.16	5.34	3.47
t-value (difference)	[-11.71]	[4.80]	[-6.27]	[-0.81]	[-0.33]

Table 4.2 shows the mean values of these characteristics prior to debt issuance, including the leverage ratio (*D/A*), market-to-book ratio (*M/B*), retained earnings (*RE/A*), size (*SIZE*), tangible assets (*PPE/A*), R&D expense (*R&D/A*), capital expenditure (*INV/A*), dividend payouts (*DIV/E*), and free cash (*CASH/A*). The variables are standardized by firm assets (except of size, market-to-book ratio and dividend). The *t*-values of the differences based on one-tail mean comparison tests with unequal variance are also shown. The results are mixed as regards the quality of the debt issuers[79], and suggest that hot and cold market debt issuers differ significantly in many of their financial features. Hot market issuers appear to be larger in size and have higher profitability than cold market issuers. In line with the work of Stoughton et al. (2001) and Benveniste et al. (2002), they also show higher growth opportunities (market-to-book ratio and R&D expenses). However, the tangible assets, retained earnings and investment rates of hot issue firms are relatively lower, whereas they show no obvious differences as regards dividend payouts and cash balances.

The most interesting feature of debt issuers is leverage. Hot issuers, on average, have a 2.31% (61.10% minus 58.81%) higher book debt ratio than cold issuers with statistical significance. The concern here is whether hot issuers borrow more than cold issuers, despite higher pre-issue book debt ratios. The variable used to measure the amount of debt issue is $Proceeds/A_t$, the percentage of newly issued debt over total assets at the end of the fiscal year when the debt was issued, or alternatively $Proceeds/A_{t-1}$, the level of debt issues compared to the pre-issue assets. A comparison of $Proceeds/A_t$ or $Proceeds/A_{t-1}$, between hot and cold market issues reveals whether the second implication of debt market timing holds, that is, whether firms issue more debt in hot markets than in cold markets. Panel A of Table 4.3 shows the average percentages of debt issue proceeds over the total assets at the beginning and end of the fiscal year when the debt was issued. As expected, both measures show that, in the hot markets, the firms issued significantly more debt than in the cold markets. The average percentage of hot debt issues over total pre-issue assets was almost 2% (0.6% measured by post-issue

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[79] The literature on hot market issuers focuses on the IPO market, and is not coincident with the quality of hot market issuers On the one hand, hot markets are characterized as periods when more high quality firms raise funds (e.g. Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989)). On the other hand, poor long-term performance implies a low quality of hot issuers (e.g. Loughran and Ritter (1995) and Field (1997)).

assets) higher than that of cold issues. The *t*-value of the two sample test with unequal variances shows that the differences of mean were statistically significant (2.4 and 3.81 respectively). Thus, the hot market debt issuers raised more debt funds than the cold market issuers, although their pre-issue leverages were significantly higher than those of the cold market issuers.

It could be argued that these differences are economically small and may be due to some firm-specific characteristics of the hot and cold market issuers. To address this issue, the following regression was run to examine the hot market effect on the debt issue amount with controlling various financial characteristics.

$$Y_t = c_0 + c_1 HD + c_2 M/B_{t-1} + c_3 RE/A_{t-1} + c_4 EBITDA/A_{t-1} + c_5 SIZE_{t-1} + c_6 PPE/A_{t-1} + c_7 R\&D/A_{t-1} + c_8 RDD/A_{t-1} + c_9 INV/A_{t-1} + c_{10} DIV/E_{t-1} + c_{11} Cash/A_{t-1} + c_{12} D/A_{t-1} + \varepsilon_t \quad (4.1)$$

The dependent variables were $Proceeds/A_t$ or $Proceeds/A_{t-1}$, which represent the debt issue volume compared to total assets at the beginning or end of the fiscal year when the debt was issued. The effects of the hot market and firm characteristics on the changes in the debt ratio, d/A_t, were also examined. The dummy variable *HD* took the value of one for the hot market issuers and zero for the cold market issuers. As regards characterizing the hot market effect, the coefficients of *HD* show the differences between the dependent variables of the hot and cold debt issuers. Although the hot effect dummy is the main focus of this analysis, many other firm-specific characteristics may also potentially determine the financing decisions of firms. Therefore, the control variables include the market-to-book ratio (*M/B*), retained earnings (*RE/A*), profitability (*EBITDA/A*), size (*SIZE*), tangible assets (*PPE/A*), R&D expense (*R&D/A*), the dummy variable of R&D (*RDD/A*), capital expenditure (*INV/A*), dividend (*DIV/E*), cash (*CASH/A*), and book leverage ratio (*D/A*). All these control variables took the pre-issue values and were standardized by the issuers' total assets. *Firstly*, the pre-issue debt ratio affects subsequent financing decisions by several means. If the trade-off hypothesis holds, in other words, if firms have a target leverage ratio, the pre-issue debt ratio would be expected to be negatively related to the new debt issuance. Otherwise, the level of newly issued debt should not correlate to the current debt ratio, or will

positively correlate if the firms believe that debt is the best source of new capital[80]. *Secondly*, the market-to-book ratio reflects the market expectation to the firm, while capital expenditures represent the firm's investment in the long run. These variables determine the firm's potential growth prospects (Fama and French, 1998) and are expected to positively affect firm's capital demands, *i.e.* the level of debt issuance. Consistent with the stakeholder theory, firms that have high R&D expenditures tend to include little debt in their capital structures (Opler and Titman 1996). *Thirdly*, retained earnings, revenue, dividend payouts and the level of cash balances reflect the requirement the firm has for new capital (*e.g.* Woolridge and Ghosh, 1985)[81]. When a firm has good investment opportunities, it is expected to have more retained earnings, fewer dividend payments and higher profitability. *Fourthly*, firms appear to differ in their financing preferences according to their size. As suggested by the pecking order of financing choices, firms prefer to finance investments with retained earning rather than external source of funds (Donaldson, 1961). Empirically, small firms rely more heavily on external capital, whereas larger firms with high profitability are more capable to raise funds from internal cash flows. If this is the case, firm size should negatively relate to debt issuance. *In addition*, tangible assets (PPE) vary significantly across industries. This variable was employed as a proxy for the industry control factor.

Panel B of Table 4.3 reports the results of the regressions. The first thing noticed is that the coefficient of the hot market dummy was significantly positive in each specification. In other words, the regression analysis confirms the pattern of hot market firms issuing more debt than cold market issuers. The coefficients of the hot market dummy were 2.73 and 6.81 in the two specifications respectively and were statistically significant, which suggests that the hot market firms issued 2.73% and 6.81% more debt than the cold market issuers when measured by $Proceeds/A_t$ and $Proceeds/A_{t-1}$ respectively, although the average pre-issue leverage was higher for the hot market firms as shown in the preceding mean comparison. In contrast to the direct comparison of mean values in panel A, the hot market effect is remained significant even after controlling the firms' characteristics.

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[80] See literature review in Section 3.2.1 and section 4.2.3 for details.

[81] Among many others, Woolridge and Ghosh (1985) reveal that dividend cut with an increases retained earning convey a signal that the firm has a desire to conserve cash to fund good investment opportunities.

In addition to the hot market effect, other control variables displayed the significant influence of the firms' features on the level of their debt issues[82]. First of all, inconsistent with the trade-off hypothesis, a high pre-issue debt ratio did not prevent the firms from deciding to issue further debt. Secondly, as expected, the firms tended to issue more debt when high growth opportunities were suggested by high market-to-book ratios and investment rates. However, the R&D did not positively influence the level of subsequent debt issuance, which may be due to its longer-run prospect. Thirdly, the retained earnings, dividends and profitability were correlated to the debt issuance in a way that is in line with the assumption of investment chances. In addition, the negative coefficient of firm size suggests that the small firms raised relatively higher level of debt from external sources than large firms.

[82] Although the influences of a firm's financial characteristics on debt issuance are not the main concern in this study, it is helpful when following the analysis to explore the underlying reasons for debt market timing in hot markets.

Table 4.3 Hot Market Effects on Debt Issue Levels

This table shows the differences between hot and cold market firms of debt issue proceeds over firms' total assets. Part A presents the mean values comparisons between hot and cold issuers in respect of $Proceeds/A_t$, and $Proceeds/A_{t-1}$. The *t*-statistics report the differences of each pair based on one-tailed mean comparison tests with unequal variances. Part B presents the regression analysis of the following specification

$$Y_t = c_0 + c_1 HD + c_2 M/B_{t-1} + c_3 RE/A_{t-1} + c_4 EBITDA/A_{t-1} + c_5 SIZE_{t-1} + c_6 PPE/A_{t-1} + c_7 R\&D/A_{t-1} + c_8 RDD_{t-1} + c_9 INV/A_{t-1} + c_{10} DIV/A_{t-1} + c_{11} Cash/A_{t-1} + c_{12} D/A_{t-1} + \varepsilon_t$$

The dependent variable Y_t represents the total debt issue proceeds over the total assets at the end and beginning of the fiscal year of the debt issue respectively ($Proceeds/A_t$, and $Proceeds/A_{t-1}$). The dummy variable *Hot-cold (HD)* takes the value of one when the debt issue takes place during a hot market period, and zero otherwise. The control variables include book leverage ratio (*D/A*), market-to-book ratio (*M/B*), retained earnings (*RE/A*), profitability (*EBITDA/A*), size (*SIZE*), tangible assets (*PPE/A*), R&D expense (*R&D/A*), the dummy variable of R&D (*RDD/A*), capital expenditure (*INV/A*), dividend (*DIV/E*), and cash (*CASH/A*). The dummy variable *RDD* takes the value of one when the research and development expense information is missing in COMPUSTAT. Apart from the dummy variables and *SIZE*, all other variables are expressed in percentage terms.

	Proceeds/At		***Proceeds/At-1***	
Panel A Mean Values				
Hot	7. 31		10. 46	
Cold	6. 68		8. 49	
t-value (difference)	[2. 4]		[3. 81]	
Panel B Regression				
Hot-cold	2. 73	[8. 13]	6. 81	[5. 94]
D/At-1	0. 109	[15]	0. 190	[7. 66]
M/Bt-1	0. 004	[2. 01]	0. 035	[4. 94]
RE/At-1	0. 004	[0. 22]	-0. 002	[-0. 03]
EBITDA/At-1	0. 199	[8. 15]	0. 041	[0. 52]
SIZEt-1	-3. 822	[-44. 4]	-7. 923	[-27]
PPE/At-1	-0. 090	[-13. 6]	-0. 118	[-5. 26]
R&D/At-1	-0. 181	[-2. 16]	-0. 519	[-1. 81]
RDDt-1	-0. 335	[-0. 80]	-2. 659	[-1. 86]
INV/At-1	0. 078	[3. 81]	0. 382	[5. 53]
DIV/Et-1	-0. 007	[-2. 68]	0. 001	[0. 11]
CASH/At-1	0. 188	[6. 74]	0. 485	[5. 08]
R^2	0. 421		0. 205	
N	3923		3968	

4.4.3. Determinants of market timing in the hot market

There are reasons other than hot market debt for why issuers raise more debt funds than cold market issuers. Firstly, the hot market issuer may have a larger debt capacity than a cold market firm. If this is the case, hot market firms are more active in taking advantage of low debt ratios and then raise more debt funds to optimise their capital structure as the market is hot. Therefore, an investigation was carried out into the pre-issue book leverage of the hot and cold market issuers with the same control variables of firm characteristics as shown in the regression (4.1). The first column of Table 4.4 displays the results of this analysis. Although the mean value comparison of the book leverage prior to the debt issues shows that the hot issuers had higher debt ratios than cold issuers (61.1% and 58.81% respectively in panel A), very interestingly it can be seen that in the regression analysis (panel B) the hot market firms did not have a larger debt capacity than the cold market firms, after controlling the various firm characteristics. The insignificant coefficient of the hot market dummy (*t*-value of -0.17) suggests that the two groups of debt issuers did not differ in their pre-issue debt ratios.[83] Thus, the evidence indicates that debt capacity or capital structure optimisation is not the primary reason for hot market firms to issue excess debt.

Another potential reason for hot market firms to issue more debt may be their faster growth. Firms with high growth opportunities will be expected to have more capital requirements currently or in the near future. Accordingly, this concern will give them the incentive to issue more capital in preparation for future investment opportunities. By replicating the same specification as model (4.1), an examination was carried out into whether the investment rates of the debt issuers were influenced by the hot market effect and other firm features. The results are reported in column (2) – (7) of Table 4.4. As opposed to the above assumption, the average investment rates were lower for the hot market issuers than the cold market issuers for the entire period of six years. The differences were statistically significant and did not disappear even five years after the debt issues occurred (keeping more than 20% in difference). The regression analysis shows that, during the first two years

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[83] Other control variables exhibited significant correlations with the pre-issue debt ratios. Since the main focus is to examine the difference between the debt ratios of hot and cold market issuers, the investigation was not extended to the more general question of corporate debt issue determinants implied by the control variables, for reasons of brevity.

subsequent to the hot issues, the investment rates of the hot market firms were significantly lower than those of the cold market firms after controlling for firm characteristics. During the following years, the differences were not significant until the fourth year after the hot market issues occurred. Below the surface of the results, the hot market firms may well still have more investment opportunities. However, this part of the investments will have been offset by more extra debt issuance, and is not exhibited in the high investment rates over a relatively long period. Therefore, there is no supportive evidence found here that hot market firms exhibit higher investment rates after issuing more debt.

The potential explanation that hot market firms raise more debt funds because they have high-return investment projects and would like to add more investment was also considered. In this case, it would be expected that the higher profitability of hot market firms would be seen. Therefore, the EBITDA was examined as the proxy for profitability between the hot and cold market firms for the five years subsequent to the hot debt issues by replicating the above analysis. However, the results show that, although the hot debt issuers exhibited a slightly better performance as regards profitability (1-1.5% higher), this difference is more likely to have been due to other differing financial characteristics of the two groups rather than to debt market timing. After controlling for firm characteristics, the coefficients of the hot market dummy in the regressions were found to be either negative or insignificantly positive over five years. In particular, in the first year after the debt was issued, the EBITDA of the hot market issuers was significantly lower than that of the cold market issuers (0.614% with -3.48 of t-value). Therefore, there is no convincing evidence that hot market issuers are more profitable. Moreover, the dividend payments show no difference between the hot and cold market firms. Therefore, it can be deduced that more debt funds issued by hot market firms do not bring higher returns of assets or more benefits (dividend payments) to the shareholders if these debt funds are raised for new investment opportunities.

In all, by introducing a hot market dummy variable, it can be seen that, to a large extent, the hot market effect reflects firms' debt market timing behaviour. Firstly, the debt issuers in the hot markets issued significantly more debt than the cold

market debt issuers, because the percentage of the hot debt issues over the total assets was significantly higher that of the cold debt issues. Moreover, the higher debt issue level of the hot market firms was not due to low pre-issue leverage or large debt capacity. On the contrary, their pre-issue debt ratios were even higher than those of the cold market firms on average. Furthermore, there is no evidence that the hot market firms grew faster than the cold market issuers. The mean comparison and the regression analysis show that the investment rates did indeed remain lower for the hot market issuers even during the five post-issue years. Additionally, the hot and cold market firms did not differ significantly as regards profitability. All the above evidence suggests that firms tend to time the market by issuing more debt when they believe the market conditions are desirable, while this financing activity is not driven by capital requirements.

Table 4.4.1 Comparison of Hot and Cold Market Firms

This table shows the comparison of hot and cold-market firms in respect of their pre-issue leverage, post-issue investment rates and post-issue profitability. Panel A presents the differences between the mean values with the *t*-statistics of each pair based on one-tailed mean comparison tests with unequal variances. Panel B presents the regression analysis of the form:

$$Y_t = c_0 + c_1 HD + c_2 M/B_{t-1} + c_3 RE/A_{t-1} + c_4 EBITDA/A_{t-1} + c_5 SIZE_{t-1} + c_6 PPE/A_{t-1} + c_7 R\&D/A_{t-1} + c_8 RDD/A_{t-1} + c_9 INV/A_{t-1} + c_{10} DIV/E_{t-1} + c_{11} Cash/A_{t-1} + c_{12} D/A_{t-1} + \varepsilon_t$$

The dependent variable Y_t is the pre-issue leverage ratio (D/A_t), the investment rates (INV/A_t), the profitability ($EBITDA/A_t$), and dividend payments (DIV/A_t) respectively. The dummy variable *Hot-cold (HD)* takes the value of one when the debt issue takes place during a hot market period, and zero otherwise. The notations of the control variables are the same as those in Table 4.3. All variables are expressed in percentage terms.

	D/A pre-issue	INV/A(t)					
Event time		Issue year	Issue year + 1	Issue year + 2	Issue year + 3	Issue year + 4	Issue year + 5
Panel A Mean Values							
Hot	61.10	8.12	7.64	7.20	7.00	6.86	6.71
Cold	58.81	10.65	10.43	9.41	8.87	8.29	7.93
t-value (difference)	[3.40]	[-9.20]	[-10.94]	[-9.62]	[-8.0]	[-6.3]	[-5.56]
Panel B Regression							
Hot-cold	-0.128	[-0.17]	-0.876	[-5.61]	-0.512	[-3.56]	-0.014	[-0.1]	0.075	[0.59]	0.246	[1.97]	0.071	[0.6]
D/At-1			0.005	[1.43]	0.007	[2.09]	0.006	[1.83]	0.006	[2.08]	-0.003	[-1.21]	0.003	[1.22]
M/Bt-1	0.018	[3.94]	-0.001	[-1.08]	0.000	[0.41]	0.004	[3.8]	0.000	[0.37]	-0.002	[-2.83]	-0.003	[-3.18]
RE/At-1	-0.446	[-10.5]	0.003	[0.37]	0.002	[0.22]	0.033	[3.29]	0.013	[1.44]	0.016	[1.95]	0.025	[3.18]
EBITDA/At-1	-0.165	[-3.31]	0.113	[9.94]	0.081	[8.05]	0.060	[5.55]	0.085	[9.27]	0.099	[11.7]	0.090	[9.52]
SIZEt-1	-0.236	[-1.26]	-0.139	[-3.48]	-0.149	[-3.81]	-0.128	[-3.22]	-0.103	[-2.92]	-0.091	[-2.56]	0.062	[1.81]
PPE/At-1	-0.242	[-17.5]	0.015	[4.94]	0.020	[6.85]	0.036	[12.1]	0.021	[7.98]	0.012	[4.32]	0.017	[6.53]
R&D/At-1	-0.699	[-3.81]	-0.064	[-1.64]	-0.080	[-2.18]	-0.068	[-1.78]	-0.112	[-3.15]	-0.034	[-1.04]	-0.067	[-1.97]
RDDt-1	3.668	[4.01]	0.411	[2.1]	0.040	[0.23]	-0.277	[-1.52]	-0.359	[-2.23]	0.224	[1.43]	-0.114	[-0.74]
INV/At-1	0.166	[3.77]	0.791	[82.7]	0.744	[82.3]	0.629	[62]	0.742	[72.8]	0.771	[71.9]	0.760	[72.7]
DIV/Et-1	-0.012	[-2.17]	0.000	[0.24]	-0.004	[-0.71]	-0.001	[-0.35]	-0.002	[-1.42]	0.000	[0.38]	-0.002	[-0.54]
CASH/At-1	-0.462	[-7.64]	0.080	[6.18]	0.080	[7.49]	0.078	[6.65]	0.041	[3.96]	0.075	[6.98]	0.055	[5.55]
R^2	0.118		0.706		0.720		0.639		0.703		0.702		0.718	
N	3968		3923		3794		3650		3537		3429		3328	

Table 4.4.2 Comparison of Hot and Cold Market Firms（Continued）

	EBITDA/At										DIV/Et	
t	Issue year		Issue year + 1		Issue year + 2		Issue year + 3		Issue year + 4		Issue year + 5		Issue year	
Panel A Mean Values														
Hot	13.76		13.95		13.87		13.80		13.81		13.45		5.52	
Cold	12.91		12.43		12.30		12.33		12.60		12.82		4.76	
t-value (difference)	[3.93]		[6.24]		[5.99]		[5.04]		[4.18]		[2.20]		[0.51]	
Panel B Regression														
Hot-cold	-0.097	[-0.55]	-0.614	[-3.48]	0.092	[0.55]	0.098	[0.51]	0.224	[1.28]	-0.338	[-1.86]	0.314	[0.75]
D/At-1	0.002	[0.63]	0.012	[2.92]	0.027	[7.11]	0.005	[1.13]	-0.002	[-0.51]	0.001	[0.39]	0.007	[0.78]
M/Bt-1	0.004	[3.88]	0.011	[9.5]	0.005	[4.13]	0.003	[2.7]	0.012	[10.6]	0.003	[2.35]	0.008	[3.2]
RE/At-1	-0.042	[-4.07]	0.008	[0.63]	0.019	[1.61]	-0.004	[-0.28]	0.018	[1.49]	-0.012	[-0.99]	-0.031	[-1.26]
EBITDA/At-1	0.751	[58.5]	0.641	[51.9]	0.838	[66.9]	0.819	[59.4]	0.686	[57.7]	0.856	[59]	0.249	[8.17]
SIZEt-1	0.197	[4.37]	0.161	[3.37]	0.082	[1.78]	0.143	[2.69]	-0.023	[-0.45]	0.066	[1.25]	0.223	[2.09]
PPE/At-1	0.005	[1.38]	0.019	[5.41]	0.031	[8.99]	0.021	[5.36]	0.018	[4.69]	0.002	[0.46]	0.063	[7.71]
R&D/At-1	0.036	[0.81]	-0.064	[-1.42]	0.065	[1.47]	-0.026	[-0.48]	0.008	[0.17]	-0.101	[-1.92]	-0.138	[-1.32]
RDDt-1	-0.091	[-0.41]	-0.782	[-3.56]	0.019	[0.09]	-0.606	[-2.51]	-0.353	[-1.61]	-0.160	[-0.67]	-1.799	[-3.42]
INV/At-1	-0.051	[-4.68]	0.050	[4.47]	-0.064	[-5.5]	-0.072	[-4.69]	0.047	[3.12]	0.023	[1.41]	-0.213	[-8.31]
DIV/Et-1	0.001	[1.13]	0.012	[1.77]	0.011	[3.32]	0.001	[0.66]	0.000	[-0.05]	0.007	[1.5]	0.021	[6.81]
CASH/At-1	-0.062	[-4.22]	-0.040	[-3]	0.029	[2.16]	0.022	[1.39]	-0.017	[-1.1]	0.027	[1.77]	-0.031	[-0.88]
R^2	0.563		0.557		0.648		0.596		0.624		0.633		0.070	
N	3923		3794		3650		3537		3429		3328		3923	

4.4.4. Hot market effect on capital structure

The preceding section compared hot and cold market debt issuers regarding various firm characteristics. It shows that the hot market effect defined by total debt issue volume captures market timing behaviour shown as the phenomenon that firms issue more debt in hot markets than in cold markets. Moreover, this effect is not primarily driven by internal capital structure rebalancing or real investment needs. This section examines the impact of debt market timing behaviour on the financing and capital structure decisions of firms.

Hot market issuers do not differ from cold market issuers in their pre-issue leverage ratios, although they do issue significantly more debt than cold market issuers. However, the leverage of hot market firms may rise substantially. Since firms may finance several times and in various ways within one year, they may adjust the influence of debt market timing accordingly. Therefore, an examination was made on the leverage changes of the debt issuers in the debt issue year ($D/A_t - D/A_{t-1}$) with the market timing effect by conducting the specification of model (4.1) in the preceding section. Apart from the replacement of the dependent variables with the changes of leverage ratio in the debt issue year, the notations of the control variables follow model (4.1) exactly. If the firms were trying to eliminate the hot market effect, the coefficient of the *HD* dummy would not be significant.

The first column of Table 4.5 shows the results. First of all, the changes in the book leverages were positive for both types of issuers. However, the mean leverage changes of the hot and cold market issuers were significantly different. As expected, the hot market firms increased their debt ratio by 1.77%, this being more than three times that of the cold market firms (0.52%). The regression analysis confirms that the difference of leverage changes between the hot and cold market issuers was significant even after controlling for firm characteristics. Moreover, this difference was mainly driven by the hot market effect, as the coefficient of the hot market dummy (1.50) was almost identical to the difference in the mean values of the leverage changes.

Baker and Wurgler (2002) deconstructed the changes in leverage by equity issues, retained earnings and the residual change in leverage that depends on the total

growth in assets from the combination of equity issues, debt issues and newly retained earnings. The change in leverage was deconstructed in the following form.

$$D/A_t - D/A_{t-1} = -e/A_t - \Delta RE/A_t + E_{t-1}(1/A_t - 1/A_{t-1})$$

$$= -e/A_t - \Delta RE/A_t + (E/A)_{t-1}(\Delta Cash + \Delta Other\ Assets)/A_t \qquad (4.2)$$

The second to fourth column of Table 4.5 replicates the analysis of the first column by replacing the dependent variables of the deconstructed terms on the right hand side of equation (4.2). These reveal the firms' dynamic adjustments of capital structure and financing policies. Not surprisingly, the net equity issues in the debt issue year were significantly lower for the hot market debt issuers. The coefficient of the hot market dummy (-2.19 percentage points) was identical to the difference in the mean net equity issues of the hot and cold market firms (0.33 versus 2.64 percentage points), which suggests that debt market timing essentially determines corresponding equity issuance. This result is consistent with previous findings, since in the case where hot market firms raise more debt funds than their actual capital needs, they are less likely to issue equity than cold market firms. In contrast, the change in cash suggests that the hot market firms in general had smaller cash balances than the cold market firms. Meanwhile, the evidence also shows that the retained earnings of the hot market firms declined significantly more than those of the cold market firms. On integrating the above results, the following fact emerges. The hot market firms issued more debt funds and their debt ratios increased more than the cold market firms. However, their retained earnings, which are the better sources for capital investments, declined significantly more than those of the cold market firms. In turn, if hot market firms do not have enough investment opportunities, as shown in preceding section, they should have surplus cash balances from excess debt issuance. In contradiction of this assumption, the cash balances of the hot market firms were lower than those of the cold market firms. Therefore, the logical explanation is that they had more cash outflows due to extra debt issues. In other words, hot market firms pay more costs for their high ratio of debt issues.

Finally, an examination was made of the post-issue leverage at the end of the debt issue year with respect to the hot market effect. The mean debt ratio was 3.46% higher (62.83% vs. 59.37%) for the hot market firms than for the cold market firms,

with a t-value of 5.81 in difference. In line with the direct comparison of the mean debt ratios, the regression replicating model (4.1), by involving hot market dummy and control variables, shows that the hot market effect significantly influenced the post-issue capital structure of the debt issuers due to the changes in debt ratios in the debt issue year. This confirms that the pre-issue debt ratio was higher for the hot market firms than for the cold market firms. If the hot market firms had been trying to maintain their capital structure at a target level, the coefficients of the hot market dummy in determining the leverage changes and the post-issue debt ratios should be zero, or negative for the reversal of leverage (it is assumed that hot and cold market firms do not in general differ in their target capital structure). However, these results suggest that the hot market effect had driven the hot issuers' capital structures to deviate from their initial levels and enlarge the difference between the debt ratios of the hot and cold issuers. Moreover, it can be seen that the difference between the post-issue debt ratios of the hot and cold market firms (1.30%) was almost identical to the differences in their pre-issue debt ratios (-0.128% in first column of Table 4.4) plus the changes in leverage ratios in the debt issue year (1.50%). Therefore, the hot market effect captures the impact of market timing on the firm's financing policy, and more importantly, is entirely orthogonal to other control variables in determining the firm's capital structure.

In summary, the above analysis goes some way in explaining how the hot market effect influences firms' financing decisions and in turn their capital structure. Debt issue markets fluctuate over time. The variations in debt market conditions and managers' predictions form hot and cold markets characterized by substantially different levels of aggregate debt issue volumes. The empirical evidence indicates that firms tend to issue more debt, compared to their total assets, in hot markets than in cold markets. The evidence shows that, on the one hand, a higher volume of debt funds neither creates higher incomes nor becomes absorbed by higher investment rates. On the other hand, since hot and cold market firms do not differ in their pre-issue capital structures, the excess debt issues of hot market firms essentially lead to higher post-issue debt ratios. Thus, a higher level of debt issue volume reflects the firm's debt market timing effect rather than the issuers' real capital needs for investment opportunities or the incentive of capital structure optimisation. As a result, debt market timing behaviour in hot markets drives firms'

capital structures away from their pre-issue level. Meanwhile, the comparisons of profitability, cash and retained earnings suggest that hot market issuers pay extra costs for their excess debt issuance.

Table 4.5 Short-term Impact of Market Timing on Capital Structure

This table shows the impact of debt issues on the firms' book leverage in the issue year and the deconstructed factors of book leverage changes. ***Panel A*** presents the differences between the mean values of the hot and cold-market firms in respect of the corresponding variables with the *t*-statistics of each pair based on one-tailed mean comparison tests with unequal variances. ***Panel B*** presents the regression analysis of the following specification.

$$Y_t = c_0 + c_1 HD + c_2 M/B_{t-1} + c_3 RE/A_{t-1} + c_4 EBITDA/A_{t-1} + c_5 SIZE_{t-1} + c_6 PPE/A_{t-1} + c_7 R\&D/A_{t-1} + c_8 RDD/A_{t-1} + c_9 INV/A_{t-1} + c_{10} DIV/E_{t-1} + c_{11} Cash/A_{t-1} + c_{12} D/A_{t-1} + \varepsilon_t$$

The dependent variable Y_t is the change in book leverage, net equity issues, the change in cash, the change in retained earnings in the debt-issue year in column 1-4 respectively. In column 5, the dependent variable is the level of book leverage at the end of the issue year. The dummy variable *Hot-cold (HD)* takes the value of one when the debt issue takes place during a hot market period, and zero otherwise. The notations of the control variables are the same as those in Table 4.3. All variables are expressed in percentage terms.

	D/A t - D/A t-1		*e/A t*		*cash/A t*		*re/A t*		*Dt/At*	
Panel A Mean Values										
Hot	1.77		0.33		0.24		-0.44		62.83	
Cold	0.52		2.64		0.56		-0.25		59.37	
t-value (difference)	[3.65]		[-6.49]		[-2.09]		[-1.15]		[5.81]	
Panel B Regression										
Hot-cold	1.50	[4.33]	-2.19	[-5.79]	0.004	[0.02]	-0.394	[-2.37]	1.30	[1.83]
D/At-1	-0.157	[-20.9]	0.002	[0.22]	0.010	[2.89]	-0.002	[-0.54]	-	-
M/Bt-1	0.004	[2]	0.016	[6.97]	0.002	[1.8]	-0.002	[-2.21]	0.020	[4.5]
RE/At-1	0.038	[1.85]	-0.639	[-28.7]	0.003	[0.36]	-0.373	[-38.3]	-0.334	[-8.12]
EBITDA/At-1	-0.032	[-1.28]	0.013	[0.46]	-0.046	[-3.94]	0.009	[0.75]	-0.214	[-4.14]
SIZEt-1	-0.337	[-3.81]	-0.694	[-7.18]	-0.523	[-12.6]	0.024	[0.57]	-0.531	[-2.93]
PPE/At-1	-0.043	[-6.27]	-0.004	[-0.51]	-0.017	[-5.4]	-0.009	[-2.77]	-0.244	[-18.2]
R&D/At-1	-0.247	[-2.85]	0.047	[0.5]	0.095	[2.34]	0.014	[0.35]	-0.797	[-4.49]
RDDt-1	-1.160	[-2.66]	2.270	[4.77]	-0.505	[-2.48]	-0.369	[-1.77]	1.779	[2]
INV/At-1	0.075	[3.51]	0.019	[0.83]	0.035	[3.5]	0.029	[2.89]	0.220	[5.05]
DIV/Et-1	-0.004	[-1.73]	0.003	[1.11]	0.000	[-0.17]	0.000	[-0.17]	-0.016	[-3.07]
CASH/At-1	0.146	[5.07]	0.045	[1.42]	-0.232	[-17.3]	-0.063	[-4.56]	-0.243	[-4.15]
R^2	0.137		0.226		0.109		0.291		0.121	
N	3923		3923		3923		3923		3923	

4.5. Long-term effect of market timing on capital structure

The preceding section revealed the pattern of capital structure variations under the hot market effect. Firstly, hot market firms do not differ in their book leverage from cold market firms prior to debt issues. Secondly, hot market firms issue significantly more debt than cold market firms do, and as a result raise their debt ratio to a greater extent. Thirdly, the post-issue leverage is higher for hot market firms than cold market firms at the end of the debt issue year. The above pattern indicates that debt market timing in the hot market pushes the issuer's capital structure to deviate away from the pre-issue level. This results in the leverage of hot market issuers being generally higher than cold market firms in the short term. A question then arises as to whether this effect is persistent in the long term or vanishes quickly.

It is clear that market timing determines a firm's financing decisions and shapes its capital structure. However, as an emerging theory of capital structure, the market timing hypothesis gives no clear indication as regards firms' debt-equity choices. One idea, raised by Baker and Wurgler (2002), indicates that the firm's capital structure is the "aggregate outcome of the firm's historical market timing behaviour". In other words, market timing determines the firm's capital structure in the long run. Firms may issue equity as the overall stock market or their own shares are overvalued, or issue debt when most firms believe the debt market conditions to be desirable. If this is the case, firms will not be seen to fix their capital structures within a target range or at an optimal level. Rather, firms will choose the security with the lowest costs of capital which depends on market conditions, and have no special preferences regarding security selections *ex anti*. This version of the market timing hypothesis on capital structure is more like a *market-oriented pecking order theory*. Another version which is more comprehensively accepted indicates that market timing only impacts on the firm's capital structure in the short run. As with the above idea, firms choose securities according to capital market conditions and based on the incentive of reducing capital costs. Firms will then tend to dynamically adjust their capital structure deviation and keep it within a target range by rebalancing the cost reduction and

risk exposure caused[84]. Therefore, this idea is based on the *modified trade-off theory*, in which market timing is involved as a short-term factor. To identify the impact of market timing on capital structure from these two different points of view, the key issue is whether the market timing effect has a persistent impact on capital structure in the long run, or whether firms tend to reverse their capital structure deviation after timing the capital market. These questions are discussed in the following section.

4.5.1. Long-term persistence of the hot market effect

Recalling the empirical results in the previous section it can be seen that, with similar pre-issue leverages, the change in the leverage of the hot market firms in hot issue years was positive and significantly higher than that of the cold market firms. Accordingly, debt issues implemented in hot markets lead to higher post-issue leverage ratios at the end of the year. How long the debt market timing effect on firms' capital structures persists is the question here. Provided that market timing has a permanent influence on capital structure, the difference in leverage between hot and cold market firms should continue to exist in the cumulative changes in leverage after hot debt issues. Assuming that firms continually time the debt market, the cumulative changes in the leverage will become greater rather than declining or vanishing. Therefore, to measure the long-term persistence of the hot market effect, it was first necessary to examine the cumulative changes in the leverage during the period starting from the year before the debt issue. The regression is specified as follows.

$$D/A_t - D/A_{pre\text{-}issue} = c_0 + c_1 HD + c_2 M/B_{t-1} + c_3 RE/A_{t-1} + c_4 EBITDA/A_{t-1} + c_5 SIZE_{t-1} + c_6 PPE/A_{t-1}$$
$$+ c_7 R\&D/A_{t-1} + c_8 RDD/A_{t-1} + c_9 INV/A_{t-1} + c_{10} DIV/E_{t-1} + c_{11} Cash/A_{t-1}$$
$$+ c_{12} D/A_{t-1} + \varepsilon_t \qquad (4.3)$$

where t is the t-th year after the debt issues. $D/A_t - D/A_{pre\text{-}issue}$ measures the cumulative changes in the debt ratios during the period from the year-end before

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[84] On the one hand, firms tend to issue debt to realize the benefit of a tax shield if equity market timing lowers the leverage ratio and then creates more debt capacity. Conversley, they will reduce debt issues or sell more equity to lower the risk of financial distress or bankruptcy in the case of a high debt ratio caused by debt market timing.

the debt issues to the *t*-th year. The dummy variable *HD* took the value of one for the hot market issuers and zero for the cold market issuers. All control variables are defined as those in Model (4.1). Part 1 of Table 4.6 shows the results of this regression. Firstly, it can be seen that the mean values of the cumulative leverage changes of the hot and cold market firms were significantly different in the five years after the hot debt issues. The regression analyses, including controlling for firm characteristics, were consistent with the above results. Thus, in the year of the hot debt issues, the hot market effect on the change in leverage was 1.50% (Table 4.5). In the first year after the hot debt issues, the hot market effect on the cumulative change in leverage was 1.28%, which does not show an essentially different decline compared to the hot issue year. In the second and third years after the hot issues, the coefficients of the hot market dummy, i.e. the hot market effect, were even larger (2.2% and 2.1% respectively). As presumed before, these results suggest that hot market firms continue to time the debt market one year after their hot debt issues. In the fourth and fifth years after the hot issues, the effect remained and exceeded the level of the first year (1.41% and 1.90% respectively). In all, the coefficients of the hot market dummy remained positive and statistically significant for each of the five post-issue years. Compared to the change in debt ratio in the hot issue year, the cumulative changes in the following several years did not decline markedly. Rather, they enlarged in the second and third years.

Thus, the pre-issue debt ratios of the hot and cold market firms did not differ as identified in the analysis of the short-term hot market effect. Following the same logic, provided that the cumulative changes in the debt ratios are significantly different between the hot and cold markets, higher levels of debt ratio for the hot market issuers would be expected in the long run. Therefore an examination was made of the year-end leverages for each year after the hot issues occurred to identify the long-term cumulative changes in leverage. The analysis of regression (4.3) was replicated with the replacement of the dependent variable by the year-end book leverage ratios. Panel A of part 2, shows that the mean debt ratios of the hot market firms varied from 62.91 to 63.4, compared to those of the cold market firms which varied from 59.27 to 59.86 during the five years after the debt issues. In comparison to the mean debt ratios of the hot and cold market firms at the end of the debt issue year (62.83 vs. 59.37, Column 5, Table 4.5), the variations in the

debt ratios after the debt issues for both the hot and cold market firms were indeed very tiny. On the other hand, the differences in the mean leverage ratios of the hot and cold firms during the five years after the hot issues occurred remained very stable at more than 3% and significant. After controlling for firm characteristics, the coefficient estimated from the regressions also identified that the leverage of the hot market firms was higher than that of the cold market firms even five years later. This pattern of leverage levels very closely matches the cumulative changes in leverage. Specifically, the differences of debt ratio levels between the hot and cold market issuers declined slightly in the first year but became more economically and statistically significant in the second and third years, and then returned to the levels of the issue year in the fourth and fifth years.

In short, the empirical results for the long-term persistence of the hot market effect are consistent with the results for the short term persistence. After the hot market effect has caused a higher debt ratio increase of hot market issuers, it persists for even longer than 5 years. This is reflected in the cumulative changes and year-end levels of the book debt ratios in the five post-issue years. These results are in line with the findings of Baker and Wurgler (2002) that market timing has highly persistent effects on firms' capital structures. One explanation of the persistent hot market effect is the hypothesis of adjustment of costs or "adverse selection cost". A number of studies have examined the adverse selection costs of rebalancing the deviation of capital structures across firms and time (e.g. Lucus and McDonald (1990), Choe, Masulis and Nanda (1993)). If the costs of deviating a capital structure from the optimal level, including the financial distress costs and agency costs, are small by contrast to the adverse selection costs, a long-lasting effect of capital structure deviation should be observed. Therefore, the persistent deviations of capital structure resulting from the hot market effect may be due to the "glutinosity" of adjustment costs despite active rebalancing. Leary and Roberts (2005) documented that the existence of adjustment costs extends the process of capital structure rebalancing over two to four years. However, the evidence presented here shows that this process lasts for longer than five years. More importantly, whereas adjustment cost is an essential determinant in the financing decisions of firms, it implicitly assumes that firms follow a dynamic rebalancing strategy and make active changes to reverse the capital structure deviation. In fact,

it is not yet known in which direction the adjustment costs prevent changes in capital structure. There is still a possibility that firms are not attempting to eliminate the deviation of their capital structure but rather they are recapitalizing new issues in forward market timing instead, as suggested by Baker and Wurgler (2002) when they argued that capital structure is the aggregate outcome of the firm's continuous market timing behaviour. Therefore, to further reveal the underlying pattern of post-timing financing implementations it is necessary to examine the debt and equity issuances that occur subsequent to hot market issues.

Table 4.6.1 Long-term Impact of Debt Market Timing on Capital Structure

The table shows the long-term persistence of debt market timing on the firms' book leverages. Panel A presents the differences between the mean values of the hot and cold-market firms in respect of the corresponding variables with the *t*-statistics of each pair based on one-tailed mean comparison tests with unequal variances. Panel B presents the regression analysis of the following specification.

$$D/A_t - D/A_{pre\text{-}issue} = c_0 + c_1 HD + c_2 M/B_{t-1} + c_3 RE/A_{t-1} + c_4 EBITDA/A_{t-1} + c_5 SIZE_{t-1} + c_6 PPE/A_{t-1} + c_7 R\&D/A_{t-1} + c_8 RDD/A_{t-1} + c_9 INV/A_{t-1} + c_{10} DIV/E_{t-1} + c_{11} Cash/A_{t-1} + c_{12} D/A_{t-1} + \varepsilon_t$$

The dependent variable Yt is the cumulative changes of the book leverage in part 1, and the levels of book leverage in part 2 for the 5 years after the issuance respectively. The dummy variable Hot-cold (HD) takes the value of one when the debt issue takes place during a hot market period, and zero otherwise. The notations of the control variables are the same as those in Table 4.3 and the regression excludes the pre-issue book leverage in part 2. All variables are expressed in percentage terms.

Part I Accumulative changes of debt ratios			$D/A_t - D/A_{pre\text{-}issue}$						
Event Time	Issue year + 1		Issue year + 2		Issue year + 3		Issue year + 4		Issue year + 5	
Panel A Mean Values										
Hot	2.01		2.60		2.94		2.96		3.02	
Cold	1.14		1.04		1.41		1.39		0.93	
t-value (difference)	[2.19]		[3.18]		[2.27]		[2.01]		[2.26]	
Panel B Regression										
Hot-cold	1.282	[2.87]	2.203	[4.27]	2.116	[3.27]	1.412	[1.93]	1.903	[2.38]
D/Apre-issue	-0.215	[-21.8]	-0.253	[-21.9]	-0.290	[-19.7]	-0.301	[-17.7]	-0.362	[-19.3]
M/Bt-1	0.004	[1.46]	0.011	[3.19]	0.023	[5.62]	0.039	[8.51]	0.054	[10.3]
RE/At-1	-0.095	[-3.14]	-0.127	[-3.57]	-0.164	[-3.69]	-0.185	[-3.78]	-0.174	[-3.3]
EBITDA/At-1	-0.201	[-6.47]	-0.411	[-10.7]	-0.528	[-11.4]	-0.579	[-12]	-0.823	[-13.2]
SIZEt-1	-0.452	[-3.72]	-0.398	[-2.81]	-0.820	[-4.56]	-0.934	[-4.49]	-1.250	[-5.45]
PPE/At-1	-0.080	[-8.98]	-0.082	[-7.84]	-0.093	[-6.84]	-0.081	[-5.09]	-0.089	[-5.03]
R&D/At-1	-0.112	[-0.98]	0.116	[0.86]	-0.489	[-2.69]	-0.868	[-4.56]	-1.141	[-4.97]
RDDt-1	-1.446	[-2.59]	-0.898	[-1.38]	-2.020	[-2.45]	-2.462	[-2.68]	-3.146	[-3.02]
INV/At-1	0.204	[7.26]	0.230	[6.38]	0.218	[4.19]	0.024	[0.38]	0.121	[1.71]
DIV/Et-1	0.060	[3.6]	0.012	[1.15]	0.011	[1.83]	-0.004	[-0.66]	0.028	[1.36]
CASH/At-1	-0.004	[-0.11]	-0.043	[-1.03]	0.015	[0.28]	0.026	[0.41]	-0.072	[-1.07]
R^2	0.140		0.152		0.142		0.134		0.156	
N	3794		3650		3537		3429		3328	

Table 4.6.2 Long-term Impact of Debt Market Timing on Capital Structure (Continued)

Part II. The level of debt ratios					**D/A (t)**					
Event Time	Issue year + 1		Issue year + 2		Issue year + 3		Issue year + 4		Issue year + 5	
Panel A Mean Values										
Hot	62.91		63.26		63.40		63.32		63.09	
Cold	59.69		59.56		59.83		59.86		59.27	
t-value (difference)	[5.16]		[5.43]		[4.41]		[3.84]		[3.80]	
Panel B Regression										
Hot-cold	0.896	[1.23]	1.974	[2.61]	1.853	[2.22]	1.201	[1.34]	1.535	[1.65]
M/Bt-1	0.030	[6.31]	0.033	[6.6]	0.039	[7.46]	0.057	[10.2]	0.074	[12.3]
RE/At-1	-0.390	[-7.92]	-0.406	[-7.82]	-0.411	[-7.2]	-0.421	[-7.06]	-0.381	[-6.26]
EBITDA/At-1	-0.370	[-7.29]	-0.568	[-10.1]	-0.615	[-10.3]	-0.751	[-12.7]	-1.044	[-14.5]
SIZEt-1	-0.595	[-3]	-0.404	[-1.95]	-0.791	[-3.4]	-0.870	[-3.41]	-1.131	[-4.24]
PPE/At-1	-0.253	[-17.9]	-0.248	[-16.6]	-0.255	[-15]	-0.234	[-12.3]	-0.206	[-10.2]
R&D/At-1	-0.920	[-4.96]	-0.498	[-2.51]	-1.112	[-4.76]	-1.522	[-6.55]	-1.754	[-6.59]
RDDt-1	1.254	[1.38]	2.263	[2.38]	0.788	[0.74]	-0.048	[-0.04]	-1.441	[-1.19]
INV/At-1	0.305	[6.66]	0.421	[8.01]	0.484	[7.24]	0.378	[4.97]	0.387	[4.75]
DIV/Et-1	0.061	[2.23]	0.014	[0.94]	0.007	[0.86]	-0.011	[-1.41]	-0.002	[-0.1]
CASH/At-1	-0.239	[-4.4]	-0.193	[-3.17]	-0.125	[-1.82]	-0.058	[-0.75]	-0.142	[-1.83]
R^2	0.132	[0]	0.138	[0]	0.134	[0]	0.151	[0]	0.156	[0]
N	3794		3650		3537		3429		3328	

4.5.2. Capital structure rebalancing

Assuming that hot market firms tend to rebalance their capital structure when the leverage ratio is high due to debt market timing, they would be expected to reduce the amount of new debt issues and raise more equity afterwards to catch up with the leverage targets. These activities reflect the active implementation of capital structure strategy and are more effective than other supplementary means such as changes in retained earnings or short-term commercial papers. However, if hot market firms are not following the trade-off strategy, no obvious tendency of capital structure reversal will be seen and the deviations of capital structure caused by market timing will exist persistently. Another possibility is that firms may continue to time the market by recapitalizing new debt if they believe the debt market to be still desirable. In this case, the differences between the debt ratios of hot and cold market firms will tend to be enlarged. It has already been found that the differences in the cumulative debt ratio changes of hot and cold market issuers exist in the long run, but it is necessary to further identify whether this result is determined by their differing financing strategies. Therefore, the differences in debt ratios were divided into newly issued equity and debt which were examined respectively for the post-hot-issue period. Taking into consideration the potential influences of various firm characteristics on pushing the leverage target away from the pre-issue level, these factors were controlled as previously in the following new issue regressions for the five years after hot issues.

$$e/A_t \text{ (or } d/A_t) = c_0 + c_1 HD + c_2 M/B_{t-1} + c_3 RE/A_{t-1} + c_4 EBITDA/A_{t-1} + c_5 SIZE_{t-1} + c_6 PPE/A_{t-1} + c_7 R\&D/A_{t-1} + c_8 RDD/A_{t-1} + c_9 INV/A_{t-1} + c_{10} DIV/E_{t-1} + c_{11} Cash/A_{t-1} + c_{12} D/A_{t-1} + \varepsilon_t \quad (4.4)$$

The dependent variables d/A_t, and e/A_t, are the newly issued debt and equity in the tth year after the hot debt issues. The dummy variable, *HD*, follows the previous notation and takes the value of one for hot market issues and zero for cold market issues. The signs of the *HD* coefficients measure the differences of the dependent variables, i.e. new debt and equity issues, between hot and cold market firms, and so reveal the underlying financing strategies subsequent to debt market timing. All control variables are defined as those in Model (4.1). The results shown in Table 4.7 were compared with three hypotheses, i.e. reversal, unchangingness or enlargement. First of all, it can be seen that the issuance of new debt remained

positive on the mean values (panel A) of both the hot and cold market firms for the five years with the exception only of the cold market issuers in the second year (-0.05% is very close to zero). There is no reduction (retirement) of debt for the hot market firms as a whole. Besides this, the average new debt issuance of the hot market firms was significantly higher in the second year and insignificantly different from the cold market firms for the other years. The regressions in panel B that controlled the effects of firm characteristics on the new debt issuances exhibited a similar pattern. There is no evidence that the hot market firms tended to reverse their capital structure by reducing their debt ratio. Rather, the positive coefficients of the hot market dummy suggest that the hot market firms issued more new debt in the five years than the cold market firms. Moreover, the difference was even significant in the second year (with a *t*-value of 3.76). Next was an examination of new equity issuances during the post-issue period. In the first three years, the hot market firms issued less equity on average, while the coefficients of the hot market dummy in the regressions were coincidently negative for all five years, suggesting that hot market firms appear to issue less equity during post-hot-issue periods. Moreover, consistent with the analysis of the new debt issues, the differences were especially significant in the two years after the hot debt issues. In general, these results reveal that hot market firms do not actively reverse the higher debt ratios caused by debt market timing. On the contrary, hot market firms appear to issue more debt and less equity after timing in hot debt markets, which is the main reason that the hot market effect lasts in the long run. This pattern was consistent when measuring both the mean values of the new debt and equity issuances and the regression analyses with the controls for firm characteristics[85].

4.5.3. Summary

This section has investigated the long-term persistence of the hot market effect and then reveals the underlying pattern of capital structure variations under the hot

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[85] Although they are not directly related to the hot market effect analysis, it is still necessary to look at the connections between firms' characteristics and their financing decisions. When looking at the control variables, it is unsurprising to find that firms with low debt ratios issue more debt. However, the market-to-book ratio is a more important determinant of equity issuance than debt issuance. Put differently, firms with a high M/B ratio are more likely to issue equity than debt. Moreover, it is found that equity issuers are more profitable than debt issuers, while generally firm size is negatively related to levels of both debt and equity issuance. Furthermore, debt issuers and equity issuers exhibit differences in their tangible asset ratios, and cash balances.

market effect. As a summary, Figure 4.2 directly plots the differences between the hot and cold market firms with respect to the long-term persistence of the hot market effect on their capital structure, and shows a complete picture. The differing cumulative changes in the debt ratios of the hot and cold market issuers remained positive, which implies that the hot market effect has a long-lasting influence. The book leverage ratios of the hot market issuers were consistently higher than those of the cold market issuers. Both variables tended to be enlarged in the second and third years. Capital structure theory points to two possible patterns that firms follow when implementing financing policies. The hypothesis followed in this thesis is that the high leverage ratio that exists after hot debt issues tends to vary according to one of the two following patterns: (1) hot market issuers follow an active strategy of rebalancing their capital structure to an optimal target, and then the hot market effect has only a short-term influence on the capital structure; or (2) the post-issue leverage does not reverse and the hot market effect is persistent in the long term due to firms' continually timing the market. The results shown in Figure 4.2 clearly support the latter. When separating the variations in capital structures by examining the new debt and equity issuances made during this period, it was found that the hot market firms, whose debt ratios were higher due to the hot market effect, issued more debt but less equity afterwards. No opposite changes in debt or equity were seen as suggested by the trade-off hypothesis. Timing the hot debt market causes an essential increase of debt ratio, while the long-tem persistence of the hot market effect is subject to firms' not intending to eliminate the effect and continuously timing attempts. Therefore, the evidence shows that a firm's timing behaviour is not a single event happening at a specific time. Rather, it is more likely to be a persistent strategy with respect to their financing policy. As a result, continual market timing drives the firm's capital away from the optimal target, if there is one, as the capital market conditions vary. Finally, the firm's capital structure is formulated as the outcome of aggregate historical market timing, as indicated by Baker and Wurgler (2002).

Table 4.7.1 Reversal of the Market Timing Effect on Capital Structure

This table shows the external financing activity in the post-issue years. Panel A presents the differences between the mean values of the hot and cold-market firms in respect of the corresponding variables with the *t*-statistics of each pair based on one-tailed mean comparison tests with unequal variances. Panel B presents the regression analysis of the following specification

$$e/A_t \text{ (or } d/A_t) = c_0 + c_1HD + c_2M/B_{t-1} + c_3RE/A_{t-1} + c_4EBITDA/A_{t-1} + c_5SIZE_{t-1} + c_6PPE/A_{t-1} + c_7R\&D/A_{t-1} + c_8RDD/A_{t-1} + c_9INV/A_{t-1} + c_{10}DIV/E_{t-1} + c_{11}Cash/A_{t-1} + c_{12}D/A_{t-1} + \varepsilon_t$$

The annual net debt issues, d/At, and net equity issues, e/At, in the 5 years after the bond issue are reported in parts 1 and 2 respectively. The dummy variable Hot-cold (HD) takes the value of one when the debt issue takes place during a hot market period, and zero otherwise. The notations of the control variables are the same as those in Table 4.3. All variables are expressed in percentage terms.

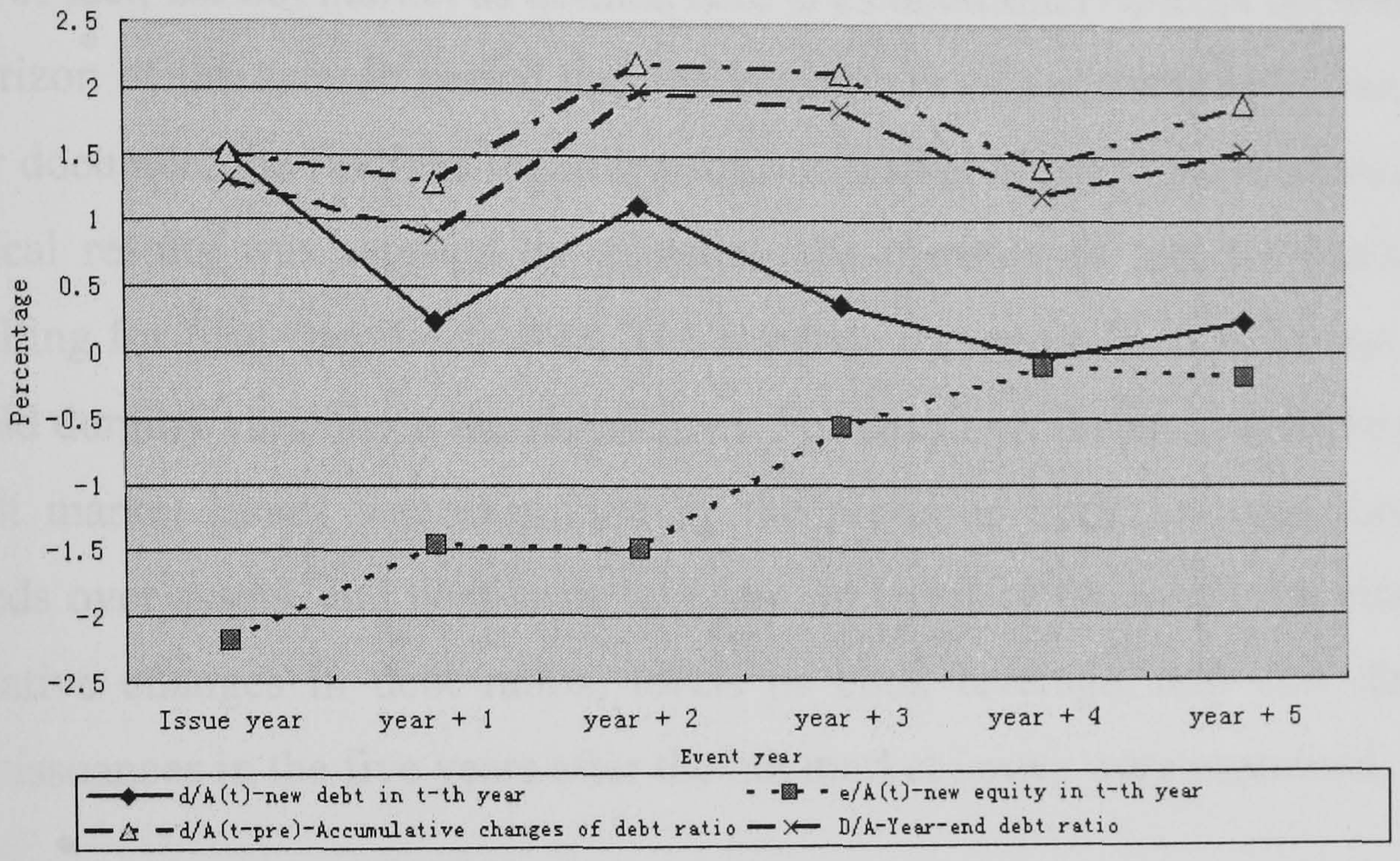
Part I					**d/At**					
Event Time	Issue year + 1		Issue year + 2		Issue year + 3		Issue year + 4		Issue year + 5	
Panel A Mean Values										
Hot	0.28		0.67		0.37		0.16		0.25	
Cold	0.44		-0.05		0.72		0.17		0.20	
t-value (difference)	[-0.64]		[2.59]		[-0.85]		[-0.01]		[0.11]	
Panel B Regression										
Hot-cold	0.232	[0.75]	1.116	[3.76]	0.357	[0.9]	-0.041	[-0.09]	0.236	[0.6]
D/At-1	-0.063	[-8.82]	-0.043	[-6.38]	-0.027	[-3.07]	-0.029	[-3.09]	-0.002	[-0.23]
M/Bt-1	-0.006	[-3.14]	-0.003	[-1.29]	0.005	[1.95]	-0.005	[-1.68]	0.002	[0.66]
RE/At-1	-0.023	[-1.07]	0.000	[0.02]	-0.009	[-0.34]	-0.012	[-0.42]	0.032	[1.22]
EBITDA/At-1	0.019	[0.88]	-0.127	[-5.74]	-0.223	[-7.78]	0.010	[0.35]	-0.097	[-3.09]
SIZEt-1	-0.120	[-1.43]	0.061	[0.75]	-0.421	[-3.81]	-0.048	[-0.38]	-0.266	[-2.34]
PPE/At-1	-0.029	[-4.64]	-0.021	[-3.42]	-0.021	[-2.49]	-0.019	[-1.95]	-0.014	[-1.65]
R&D/At-1	0.044	[0.55]	0.166	[2.13]	-0.278	[-2.5]	-0.111	[-0.96]	0.000	[0]
RDDt-1	0.009	[0.02]	0.538	[1.44]	-0.875	[-1.74]	0.336	[0.61]	-0.062	[-0.12]
INV/At-1	0.069	[3.55]	0.099	[4.76]	0.097	[3.04]	-0.100	[-2.65]	0.025	[0.73]
DIV/Et-1	0.012	[1.04]	-0.006	[-1.02]	-0.001	[-0.21]	-0.001	[-0.35]	-0.005	[-0.53]
CASH/At-1	0.040	[1.71]	0.022	[0.91]	0.099	[3.01]	0.094	[2.47]	-0.069	[-2.08]
R^2	0.030		0.030		0.035		0.012		0.008	
N	3794		3650		3537		3429		3328	

Table 4.7.2 Reversal of the Market Timing Effect on Capital Structure (Continued)

Part II					**e/At**					
Event Time	Issue year + 1		Issue year + 2		Issue year + 3		Issue year + 4		Issue year + 5	
Panel A Mean Values										
Hot	0.40		0.04		-0.05		0.69		0.55	
Cold	1.28		0.83		-0.62		0.16		-0.01	
t-value (difference)	[-2.23]		[-1.86]		[1.09]		[0.57]		[0.68]	
Panel B Regression										
Hot-cold	-1.464	[-3.7]	-1.497	[-3.88]	-0.569	[-1.3]	-0.105	[-0.08]	-0.183	[-0.14]
D/At-1	-0.017	[-1.84]	-0.025	[-2.8]	-0.020	[-2.06]	0.355	[12.9]	0.300	[11.2]
M/Bt-1	0.022	[8.58]	0.019	[7.45]	0.007	[2.48]	0.028	[3.35]	0.023	[2.72]
RE/At-1	-0.784	[-29.2]	-0.791	[-29.5]	-0.845	[-28]	-0.679	[-7.82]	-0.711	[-8.29]
EBITDA/At-1	-0.038	[-1.39]	0.092	[3.2]	0.235	[7.42]	0.009	[0.1]	0.061	[0.59]
SIZEt-1	-0.375	[-3.49]	-0.340	[-3.21]	0.222	[1.82]	-0.569	[-1.55]	-0.424	[-1.14]
PPE/At-1	0.014	[1.7]	0.015	[1.93]	0.011	[1.21]	0.136	[4.85]	0.112	[3.94]
R&D/At-1	-0.028	[-0.27]	0.103	[1.02]	0.239	[1.94]	0.147	[0.44]	0.246	[0.66]
RDDt-1	0.715	[1.45]	1.052	[2.17]	2.172	[3.9]	0.483	[0.3]	1.580	[0.93]
INV/At-1	0.028	[1.12]	0.012	[0.45]	0.048	[1.36]	-0.094	[-0.85]	-0.135	[-1.18]
DIV/Et-1	-0.030	[-2]	-0.002	[-0.29]	-0.001	[-0.13]	0.005	[0.42]	-0.006	[-0.17]
CASH/At-1	-0.024	[-0.8]	-0.037	[-1.17]	-0.068	[-1.87]	0.193	[1.73]	0.245	[2.25]
R^2	0.215		0.228		0.216		0.087		0.078	
N	3794		3650		3537		3429		3328	

Figure 4.2 Long-term Effects of Hot Market Issues on Capital Structure

This figure exhibits the long-term effect of the hot market issues on capital structure. It plots the differences between the hot and cold market issuers with respect to changes in leverage. The dash-point line shows the cumulative changes of debt ratio ($d/A_{t\text{-}pre}$) after the hot market issues. The wide dash line shows the levels of debt ratios (D/A_t) after the hot market issues. The point line shows annual the new equity issuances (e/A_t) after the hot market issues. The solid line shows the annual new debt issuances (d/A_t) after the hot market issues.



4.6. Robustness

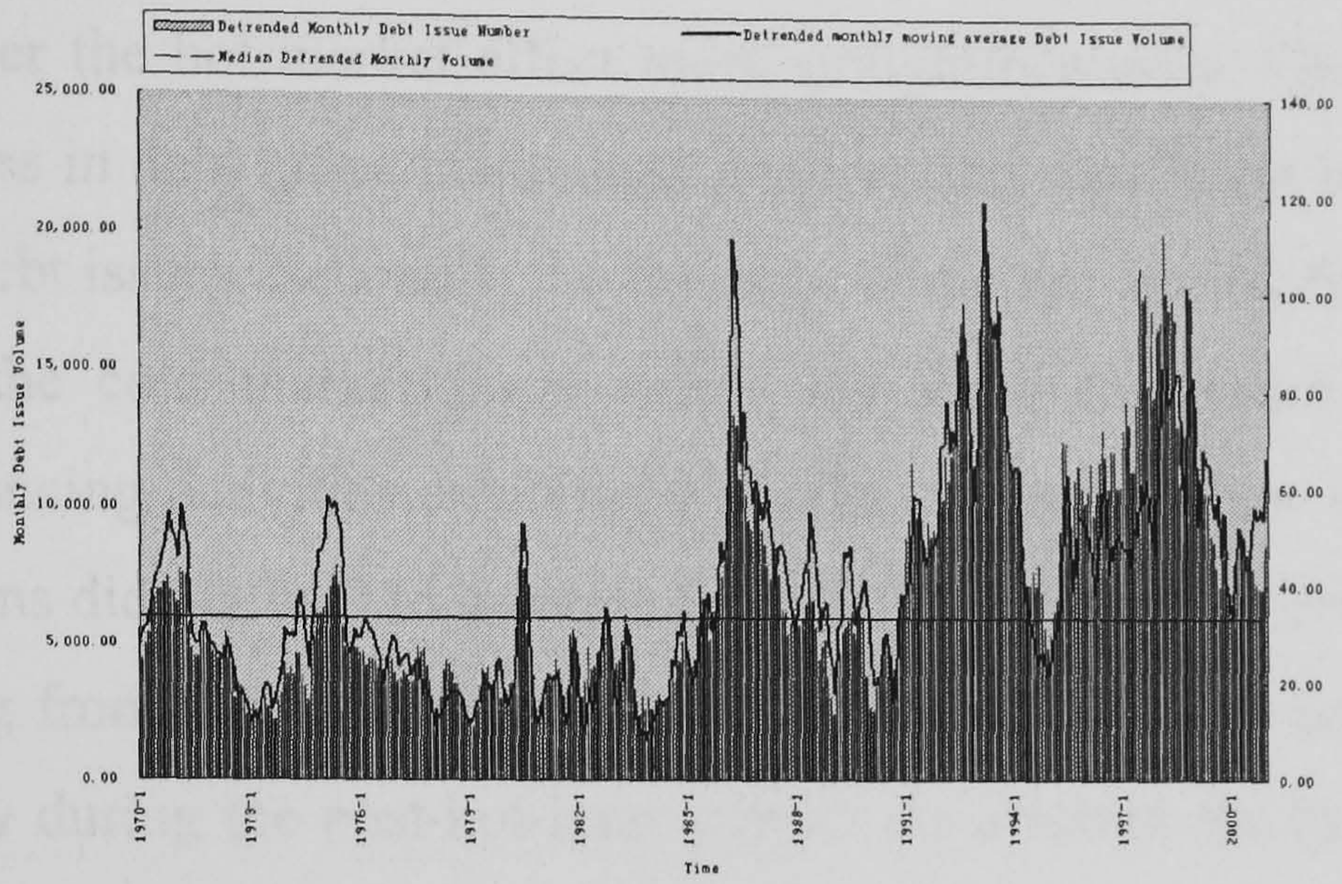
The hot market effect measured by the *Hot-cold* dummy variable is the main focus of this study in examining firms' market timing attempts. In turn, the definition of the hot and cold market is a key issue in measuring the hot market effect. As a matter of fact, the hot market as defined here is a conditional concept depending on the horizon of the sample period and the benchmark of compartmentalization. To further document the findings regarding the hot market effect, the robustness of the empirical results was retested by adjusting the measure of the hot market and controlling for firm-specific factors. The results only report the coefficients of the hot-cold dummy variable in the regressions. For each test, the short-term impact of the hot market issues was examined by the pre-issue book leverage, hot issue proceeds over assets, and post-issue leverage. In terms of the long-term effect, the cumulative changes in debt ratios, levels of book leverage, and new debt and equity issuances in the five years after the hot market issues were examined.

4.6.1. Alternative hot market measure

The judgement of firm managers regarding debt market conditions is changeable and sometimes divergent. Therefore, it is hard to accurately categorize time periods as hot and cold, especially for months with a neutral level of debt issue volume. Empirical studies have employed different measures for hot and cold markets. For example, Helwege and Liang (2004) defined the hot market as months with issue volumes of more than the top quartile, while Alti (2006) categorized hot and cold markets by the median of the monthly debt issue volume. The measure of hot debt issue months by the top 30 percentile aggregate issue volume is reasonable and acceptable, but relatively subjective. Therefore, it is crucial to examine whether the debt issues taking place in the months of the median 40 percentile ranked by issue volume had a determinant influence on the results. Therefore, following Alti (2006), the restriction of the hot market definition was eased by using the median of the monthly debt issuance instead of the top (bottom) 30 percent to categorize the market as hot or cold, and involved all the debt issues that occurred during the whole sample period, as shown in the figure below.

Figure 4.3 Hot Debt Market Defined by the Median Issue Volume

Figure 4.3 plots the accumulated monthly corporate debt issue volumes and deal numbers for the period January 1970 - December 2000 in constant dollars measured as of 1st January 2001. The monthly debt issue volumes and deal numbers are adjusted by a 3-month de-trended moving average to smooth out seasonal variations. The horizontal line denotes the median de-trended monthly volume in constant dollars measured as of 1st January 2001 across the sample period. It divides the sample into the sub-groups by the months with the upper 50% and the bottom 50% of de-trended monthly issue volume, which are defined as the hot and cold debt market respectively.



* The horizontal line is the median detrended monthly volume in constant dollars measured as of 1st January 2001.

Following the methodology discussed in previous sections, the analysis of the hot market effect on capital structure in both the short and long term was replicated. Table 4.8 shows the key results of the hot market dummy. In contrast to the previous results, which contained about 3,000 observations, these results involved all 6,000 observations and are consistent qualitatively and quantitatively. In the short term, the pre-issue debt ratios did not differ between the hot and cold market firms. However, since the percentage of debt issues over total assets is significantly higher for the hot issues, the post-issue year-end debt ratios were significantly increased due to the hot debt issues. The investment rates and profitability exhibited similar patterns to those in the previous results (not reported here). The hot market issuers were not more profitable but their investment rates were essentially lower than those of the cold market issuers. Next an examination was made of the long-term effect. As expected, the coefficients of the hot-cold dummy were generally smaller than those in the previous results in absolute values, since the samples in the neutral months may be capable of being sorted into hot or cold months. However, most importantly, it was found that the patterns of capital structure variations were almost the same as in the previous results with respect to both the magnitude and significance of the coefficients. For example, the dummy

coefficients of the cumulative changes in the debt ratios were 1.15, 1.69, 1.71, 1.21, and 1.1 respectively from one to five years, compared to the corresponding results of 1.28, 2.2, 2.12, 1.41, and 1.9 in Table 4.6. The coefficients of the other dependent variables were also very similar to the previous results.

In comparison to Figure 4.2, Figure 4.4 shows the pattern of capital structure variations under the hot market effect more straightforwardly. Firstly, this shows that the changes in debt ratios maintained positive and significant in the five years after the hot debt issues. Secondly, the leverage of the hot market firms was higher than that of the cold market firms within the same five years. Thirdly, their post-issue financing activities exhibited a similar tendency. More specifically, the hot market firms did not tend to increase their equity issues to reverse the high debt ratios resulting from their hot debt issues. On the contrary, they issued more debt and less equity during the post-hot-issue period. As a result, the hot market effect still persisted for five years after the involvement of samples belonging to the neutral periods. These results suggest that firms' timing behaviours are positively related to the extent to which the market is hot, regardless of the definition.

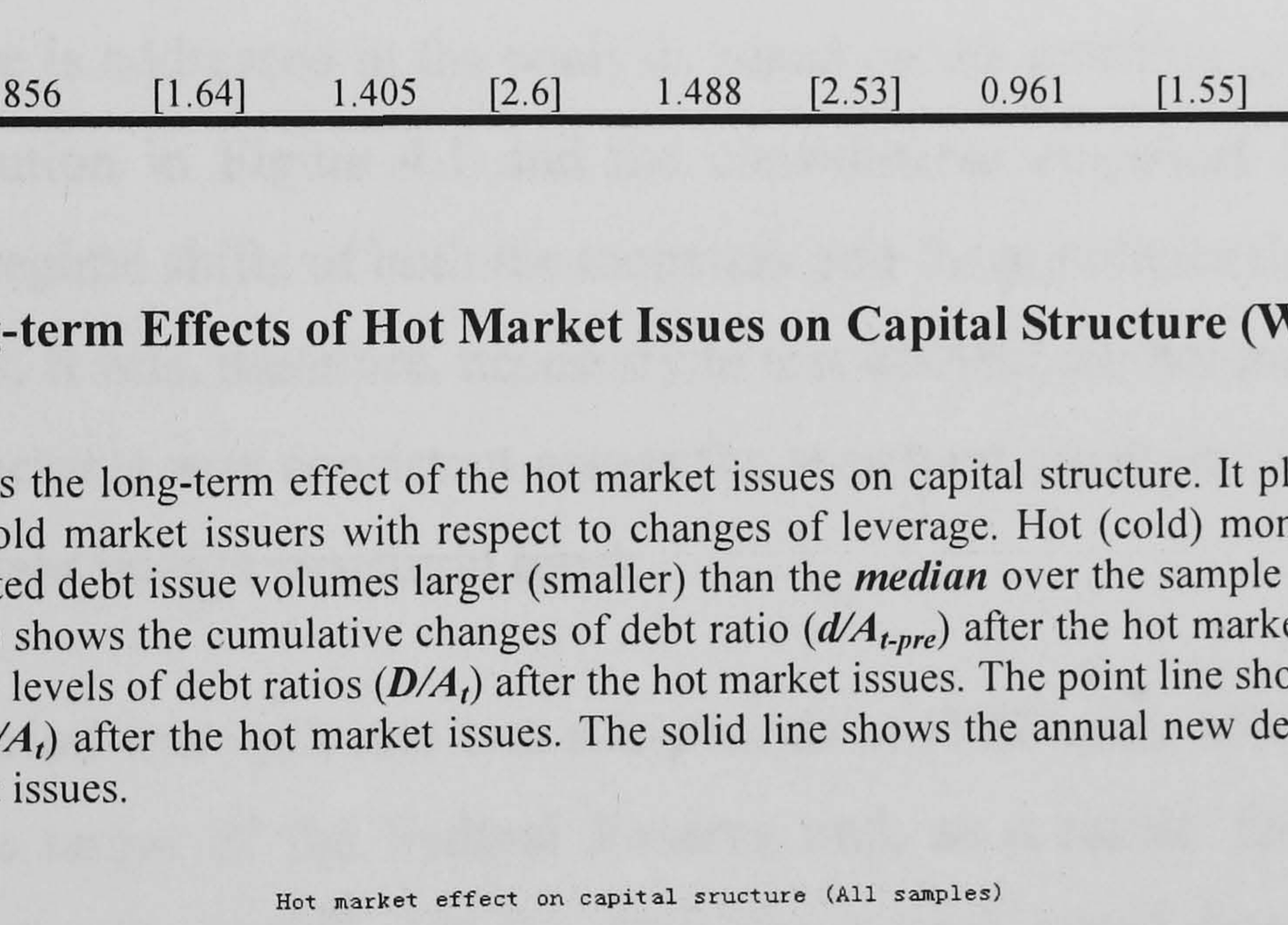
Table 4.8 Hot Market Effect on Capital Structure (whole sample)

This table shows the short and long-term impacts of the hot market debt issues on the capital structure with the involvement of all samples. Only the coefficients of the hot-cold dummy are reported. The hot (cold) markets are defined as the months with a cumulative debt issue volume larger (smaller) than the ***median*** (instead of the top or bottom 30%) monthly issue volume over the sample period January 1970 - December 2000. The short-term effects are examined by the ratio of hot debt issues over total assets ($Proceeds/A_t$), pre-issue debt ratio (D/A_{t-1}), change in debt ratios (D/A_t-D/A_{t-1}) and post-issue debt ratios (D/A_t). The long-term impacts are examined by the accumulative changes in the debt ratios ($d/A(t\text{-}pre)$), annual new debt issues (d/A), annual new equity issues (e/A), and the levels of the year-end book debt ratios (D/A) in the five years after the hot debt issues.

Short-term effect	**Proceeds/Asset(t)**		**D/A(t-1)**		**D/A(t)-D/A(t-1)**		**D/A(t)**			
Hot-cold dummy	1.960	[8.11]	0.276	[0.545]	1.105	[4.15]	1.255	[2.5]		
N	6049		6110		6049		6049			
Long-term effect										
t	Issue year +1		Issue year +2		Issue year +3		Issue year +4		Issue year +5	
N	5860		5650		5479		5309		5153	
d/A (t-pre)										
Hot-cold dummy	1.152	[3.37]	1.691	[4.35]	1.707	[3.68]	1.213	[2.42]	1.107	[1.93]
d/A (t)										
Hot-cold dummy	0.298	[1.27]	0.681	[2.99]	0.260	[0.91]	-0.061	[-0.21]	0.058	[0.16]
e/A (t)										
Hot-cold dummy	-0.857	[-2.89]	-0.906	[-2.89]	-0.360	[-1.11]	-0.263	[-0.34]	-0.124	[-0.15]
D/A (t)										
Hot-cold dummy	0.856	[1.64]	1.405	[2.6]	1.488	[2.53]	0.961	[1.55]	0.866	[1.32]

Figure 4.4 Long-term Effects of Hot Market Issues on Capital Structure (Whole Sample)

This Figure exhibits the long-term effect of the hot market issues on capital structure. It plots the differences between hot and cold market issuers with respect to changes of leverage. Hot (cold) months are defined as those with aggregated debt issue volumes larger (smaller) than the ***median*** over the sample period 1970-2000. The dash-point line shows the cumulative changes of debt ratio ($d/A_{t\text{-}pre}$) after the hot market issues. The wide dash line shows the levels of debt ratios (D/A_t) after the hot market issues. The point line shows annual the new equity issuances (e/A_t) after the hot market issues. The solid line shows the annual new debt issuances (d/A_t) after the hot market issues.



4.6.2. Structural shifts in the debt market

The change in debt issue volume is economically intuitive in Figure 4.1. It can be seen that most of the hot months happened after 1985, while most of the pre-1985 months were cold. The level of debt issues was overall higher after 1985, which was due to drastic changes in the US monetary and fiscal policies during the early 1980s. The regime shift in the post-war United States was "that of the "Volcker experiment" in the early 1980s, when the Federal Reserve began a zero inflation policy in order to control raising inflation" (Butler et al. (2006), p. 1739). This period is the most commonly identified structural break in the term structure, time series and macroeconomics literature. The hot market dummy may reflect different characteristics of economy across regulation variations and debt market conditions. Although a full investigation of the history, causes and consequences of monetary and fiscal policy and their impact on US interest rates is beyond the scope of this study, this issue is addressed in the analysis based on the intuition gained from the sample distribution in Figure 4.1 and the considerable empirical evidence with respect to the regime shifts of both the monetary and fiscal policies that occurred in the early 1980s. It was, therefore, necessary to test whether the hot market effect on the capital structures was consistent across the structural break, or was it simply a proxy for the debt market structural break.

The sample period was split into two sub-periods at 1982 when zero inflation was pursued as the target of the Federal Reserve and, as a result, the debt market experienced a regime shift[86]. All the debt issues were sorted into hot and cold markets defined as the months with cumulative debt issue volumes larger or smaller than the median of each sub-period. The analysis replicated that in the preceding section and the results of the short and long-term effects are reported in Table 4.9. In general, the results are qualitatively consistent with the previous findings. However, there are still some points to be noted. In the short term, the hot market effect was more significant in the post-1982 than in the pre-1982 period. Specifically, the percentage difference between the hot issue proceeds over the total assets of the hot and cold issues was even higher after 1982 (5.17% vs.

[86] The Federal Reserve D ata shows that the yield rates of the 10-year constant maturity Treasury bonds and the BAA corporate bonds reached the highest points (13.70% and 16.04% in 1981, and 13% and 16.11% in 1982 respectively) of the past three decades in 1981 and 1982 (data from the Saint Louis's FRED database of the Federal Reverse Bank).

2.08%), as were the changes in and levels of debt ratios in the hot issue year. The pre-issue debt ratio of the hot issuers was found to be significantly higher than that of the cold issuers in the post-1982 period (t-value of 6.32), which may potentially be the result of the previous cumulated hot market effect. More importantly, the high pre-issue leverage ratio did not prevent the hot market issuers from further timing the debt market and issuing more debt. In the long term, the cumulative hot market effects existed during the pre-1982 period and more substantially during the post-1982 period. Similarly, the hot market firms issued more debt and less equity than the cold market firms, both before and after the debt market shift. This pattern is fully reflected in Figure 4.5. In contrast, the hot market effect was more apparent in the post-1982 period due to the desirable debt market conditions caused by the drastic change in the monetary and fiscal policies, i.e. low interest rates and inflation. Firms are more likely to time the debt market in these circumstances. However, the hot-cold dummy captures the general pattern of debt market timing which is applicable to different market environments.

Table 4.9 Hot Market Effect on Capital Structure between Regime Shift

This table shows the short and long-term impacts of the hot market debt issues on the capital structures before and after the structural shift of the debt market in 1982, with the involvement of all samples. The hot (cold) markets are defined as the months with cumulative debt issue volumes larger (smaller) than the ***median*** (instead of the top or bottom 30%) monthly issue volume of each sub-period. The short-term effects are examined by the ratio of hot debt issues over total assets ($Proceeds/A_t$), pre-issue debt ratio (D/A_{t-1}), change in debt ratios (D/A_t-D/A_{t-1}) and post-issue debt ratios (D/A_t). The long-term impacts are examined by the accumulative changes in the debt ratios ($d/A(t\text{-}pre)$), annual new debt issues (d/A), annual new equity issues (e/A), and the levels of the year-end book debt ratios (D/A) in the five years after the hot debt issues.

1970-1981

Short-term effect	Proceeds/Asset(t)		D/A (t-1)		D/A(t)-D/A(t-1)		D/A(t)			
Hot-cold	2.08	[5.51]	-0.691	[-0.99]	0.530	[1.8]	0.646	[2.03]		
N	1357		1363		1357		1357			
Long-term effect										
t	Issue year +1		Issue year +2		Issue year +3		Issue year +4		Issue year +5	
N	1349		1327		1312		1293		1279	
	Hot-cold	t	Hot-cold	t	Hot-cold	t	Hot-cold	t	Hot-cold	t
d/A (t-pre)	0.577	[1.16]	0.341	[0.69]	1.539	[2.65]	1.395	[0.69]	1.536	[0.82]
d/A (t)	0.395	[0.95]	0.188	[0.58]	0.899	[2.8]	0.400	[1.07]	0.175	[0.36]
e/A (t)	-0.063	[-0.12]	-0.075	[-0.17]	-1.046	[-2.36]	-0.709	[-1.39]	-0.152	[-0.24]
D/A (t)	-0.194	[-0.28]	-0.362	[-0.54]	0.996	[1.36]	0.647	[0.8]	1.136	[1.27]

1982-2000

Short-term effect	Proceeds/Asset(t)		D/A (t-1)		D/A(t)-D/A(t-1)		D/A(t)			
Hot-cold	5.17	[20.2]	3.469	[6.23]	2.477	[8.17]	5.343	[9.72]		
N	4692		4747		4692		4692			
Long-term effect										
t	Issue year +1		Issue year +2		Issue year +3		Issue year +4		Issue year +5	
N	4511		4323		4167		4016		3874	
	Hot-cold	t	Hot-cold	t	Hot-cold	t	Hot-cold	t	Hot-cold	t
d/A (t-pre)	2.368	[6.16]	2.465	[5.51]	3.277	[6.06]	3.529	[5.86]	2.952	[4.39]
d/A (t)	0.222	[0.86]	0.210	[0.8]	0.514	[1.52]	0.692	[1.92]	0.008	[-0.02]
e/A (t)	-0.063	[-0.12]	-0.075	[-0.17]	-1.046	[-2.36]	-0.709	[-1.39]	-0.152	[-0.24]
D/A (t)	4.435	[7.65]	4.450	[7.26]	5.341	[7.9]	5.597	[7.76]	4.696	[6.1]

Figure 4.5 Hot Market Effects on Long-term Capital Structure between Regime Shift

Figures 4.5a and 4.5b exhibit the long-term effect of the hot market issues on the capital structures before and after the regime shift in 1982 respectively. They plot the differences between the hot and cold market issuers with respect to changes of leverage. The dash-point line shows the cumulative changes of debt ratio ($d/A_{t\text{-}pre}$) after the hot market issues. The wide dash line shows the levels of debt ratios (D/A_t) after the hot market issues. The point line shows annual the new equity issuances (e/A_t) after the hot market issues. The solid line shows the annual new debt issuances (d/A_t) after the hot market issues.

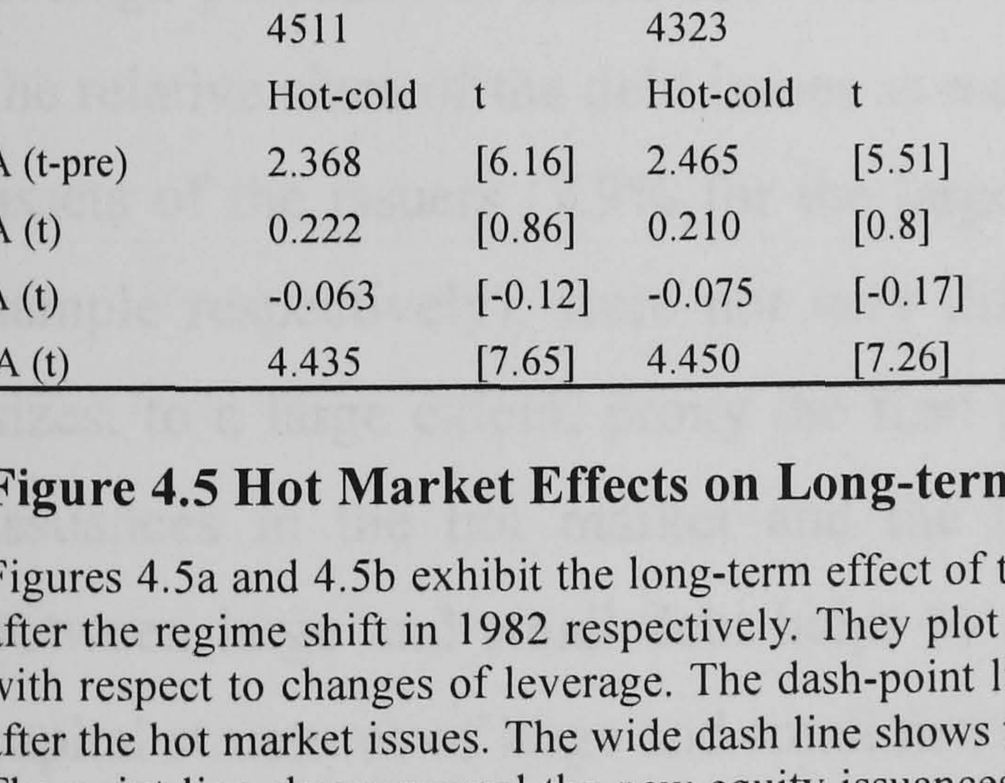


Figure 4.5a

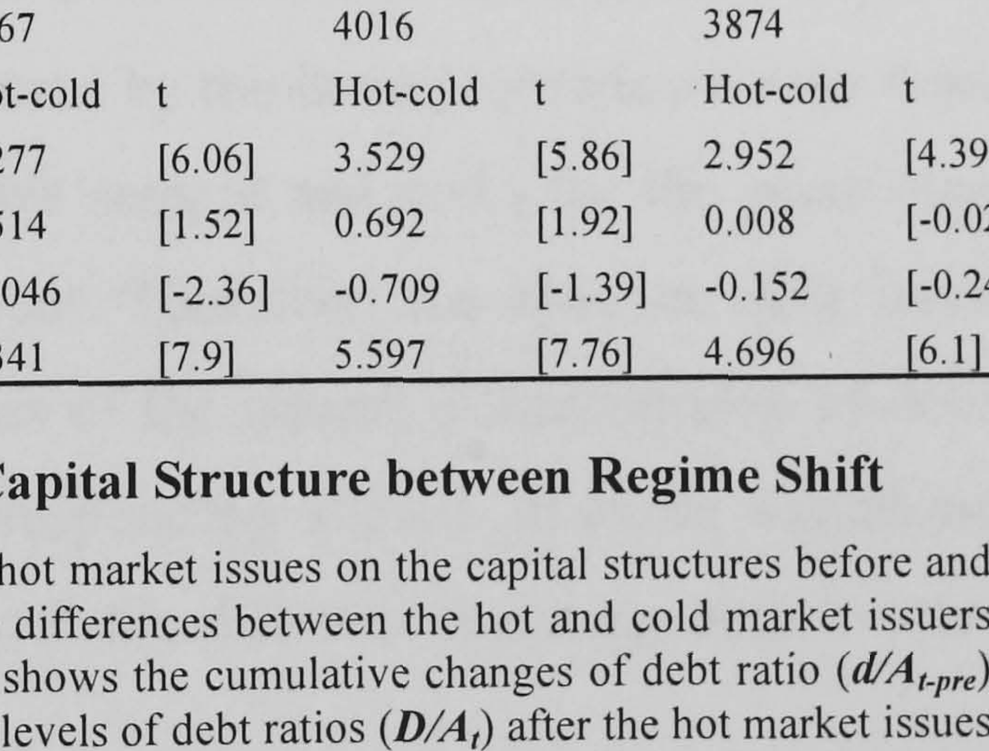


Figure 4.5b

4.6.3. Debt issue size and market timing

The influence of debt issues on firms' capital structures and financial characteristics differs according to the size of the debt, which in turn essentially determines firms' subsequent financing decisions and policies. Large debt issues are more influential as regards the formation of the hot market which may potentially influence other issuers' financing decisions that follow. Therefore, an interesting investigation is into the effect of debt issue sizes on the pattern of issuers' financing policies. The sample was sorted into groups of large issues and small issues, measured by the median of all the debt issues over the sample period in the constant 2001 dollar. The relative size of the debt issues compared to firm assets was not used for this purpose because previous evidence has shown that firms raise the percentage of debt volume when the market is hot. Therefore, the relative size may only proxy the hot market effect and cannot reflect the general difference in firms' financing patterns between hot and cold markets. The average proceeds of the large issues was 371.55 million 2001 dollars, compared to the average proceeds of small debt which were 87.36 million 2001 dollars. However, the relative sizes of the debt issues as measured by the issue proceeds over the total assets of the issuers (7.9% for the large size sample and 6.9% for the small size sample respectively), were not very different. Therefore, the absolute debt issue sizes, to a large extent, proxy the firm sizes of the issuers. A comparison of debt issuances in the hot market and the corresponding capital structure variations between large and small debt helps to reveal the different financing policies and capital structures of large and small firms.

Table 4.10 shows the results of this investigation. First of all, the hot market effect can be seen for each of the large and small samples, while the difference between the hot and cold market firms was more significant for the large debt issues (4.3 vs. 1.47). However, for the small debt issues, the pre-issue debt ratio of the hot market firms was lower than that of the cold market firms (-0.936 with a t-value -1.51). Similar to the previous results, it was not found that hot market issuers had higher investment rates and profitability (these results are not reported here). Therefore, the hot market effect may be due to large debt capacity and optimization of capital structure. Although, as a result of the hot market effect, the post-issue debt ratio

was higher for the hot market firms than the cold market firms (a difference of 1.068 with a t-value 3.52), the hot market effect was found to disappear soon after the hot issue year and then the book debt ratio of the hot market firms became very close to that of the cold market firms. Meanwhile, the hot market firms tended to reduce new debt issues as well as increase equity issues during the post-hot-issue period. Therefore, apart from consistent debt market timing behaviour, an entirely different pattern of capital structure implementation for small size debt issuers was found. The evidence shows that the small debt issuers actively rebalanced their capital structure after making hot market debt issuances. In contrast, the results for the large issue sample followed the previous pattern even more significantly. The cumulative differences in the debt ratio changes of the hot and cold market firms were significantly positive for all of the five post-issue years, as were the year-end debt ratio levels. There was no tendency of the debt ratio differences being eliminated. The differences in the new debt issuances of the hot and cold market firms were positive for all of the five post-issue years (significant for the first three years), while the differences in the new equity issuances were negative for same period (significant for the first three years).

Figure 4.6 shows the differences in the long-term capital structure variations of hot and cold market issuers for the large and small size debt issues respectively. The large-size debt exhibited a similar pattern to that in the previous results. The hot market effect lasted for the long term and there was no apparent tendency for the higher debt ratios of the hot market firms to decline in the five years. During this period, the new debt and equity issuances remained positive and negative respectively. However, it can be seen that the small debt issuers clearly reversed their high debt ratio resulting from the hot debt issues by reducing their debt and raising more equity between the second and fourth year after the hot issues. Accordingly, the cumulative effect of the hot debt issues declined and vanished in two to three years, and the higher leverage of the hot market firms also returned to the pre-issue level within about two years. These results are consistent with the evidence of Leary and Roberts (2005) that the effect of a large shock on leverage is erased within two to four years subsequent to the shock. According to the hypothesis of adjustment costs, firms may easily reverse their capital structure for small deviations using supplementary instruments such as short-term commercial

papers, which is also consistent with the results of Leary and Roberts (2005) that leverage adjustment costs are negatively correlated to the deviation levels of the leverage. On the other hand, since the sizes of debt issues may proxy the sizes of issuers, the different patterns of long-term capital structure variations may reflect not only the different financing policies but also the long-term capital structure strategies of large and small firms.

Table 4.10 Hot Market Effect on the Capital Structure of Large and Small Issuers

This table shows the short and long-term impacts of the hot market debt issues on the capital structures of large and small debt issuers, sorted by the median volume with the involvement of all samples. The hot (cold) markets are defined as the months with cumulative debt issue volumes larger (smaller) than the ***median*** (instead of top or bottom 30%) monthly issue volume over the sample period January 1970 - December 2000. The short-term effects are examined by the ratio of hot debt issues over total assets ($Proceeds/A_t$), pre-issue debt ratio (D/A_{t-1}), change in debt ratios (D/A_t-D/A_{t-1}) and post-issue debt ratios (D/A_t). The long-term impacts are examined by the accumulative changes in the debt ratios ($d/A(t\text{-}pre)$), annual new debt issues (d/A), annual new equity issues (e/A), and the levels of the year-end book debt ratios (D/A) in the five years after the hot debt issues.

Small Issues

Short-term effect	Proceeds/Asset(t)		D/A(t-1)		D/A(t)-D/A(t-1)		D/A(t)	
Hot-cold	1.47	[4.69]	-0.936	[-1.51]	1.266	[3.87]	1.068	[3.52]
N	3021		3054		3021		3021	
Long-term effect								
t	Issue year +1		Issue year +2		Issue year +3		Issue year +4	
N	2926		2810		2723		2651	
	Hot-cold	t	Hot-cold	t	Hot-cold	t	Hot-cold	t
d/A (t-pre)	0.594	[1.37]	0.988	[1.98]	0.583	[0.96]	-0.310	[-0.46]
d/A (t)	-0.031	[-0.09]	0.576	[1.82]	-0.371	[-0.95]	-0.755	[-1.74]
e/A (t)	-0.442	[-1.08]	-0.748	[-1.84]	0.451	[1]	0.550	[1.02]
D/A (t)	-0.270	[-0.43]	0.148	[0.22]	-0.201	[-0.27]	-0.862	[-1.09]

Short-term effect	Proceeds/Asset(t)		D/A% (t-1)		D/A(t)-D/A(t-1)		D/A(t)			
Hot-cold	4.30	[2.59]	1.55048	[1.91]	1.145	[2.52]	2.487			
N	3028		3056		3028		3028			
Long-term effect										
t	Issue year +1		Issue year +2		Issue year +3		Issue year +4		Issue year +5	
N	2934		2840		2756		2658		2592	
	Hot-cold	t	Hot-cold	t	Hot-cold	t	Hot-cold	t	Hot-cold	t
d/A (t-pre)	1.816	[3.39]	2.588	[4.24]	2.708	[3.84]	2.231	[2.87]	2.033	[2.54]
d/A (t)	0.659	[2.02]	0.842	[2.54]	0.959	[2.31]	0.354	[0.86]	0.301	[0.65]
e/A (t)	-1.231	[-2.83]	-1.204	[-2.47]	-1.318	[-2.81]	-1.736	[-1.15]	-1.505	[-0.98]
D/A (t)	2.112	[2.52]	2.841	[3.29]	2.969	[3.24]	2.415	[2.53]	2.366	[2.49]

Figure 4.6 Hot Market Effects on the Long-term Capital Structure of Large and Small Issuers

Figures 4.6a and 4.6b exhibit the long-term effect of the hot market issues on the capital structures of large and small issuers respectively. They plot the differences between the hot and cold market issuers with respect to changes of leverage. The dash-point line shows the cumulative changes of debt ratio ($d/A_{t\text{-}pre}$) after the hot market issues. The wide dash line shows the levels of debt ratios (D/A_t) after the hot market issues. The point line shows annual the new equity issuances (e/A_t) after the hot market issues. The solid line shows the annual new debt issuances (d/A_t) after the hot market issues.

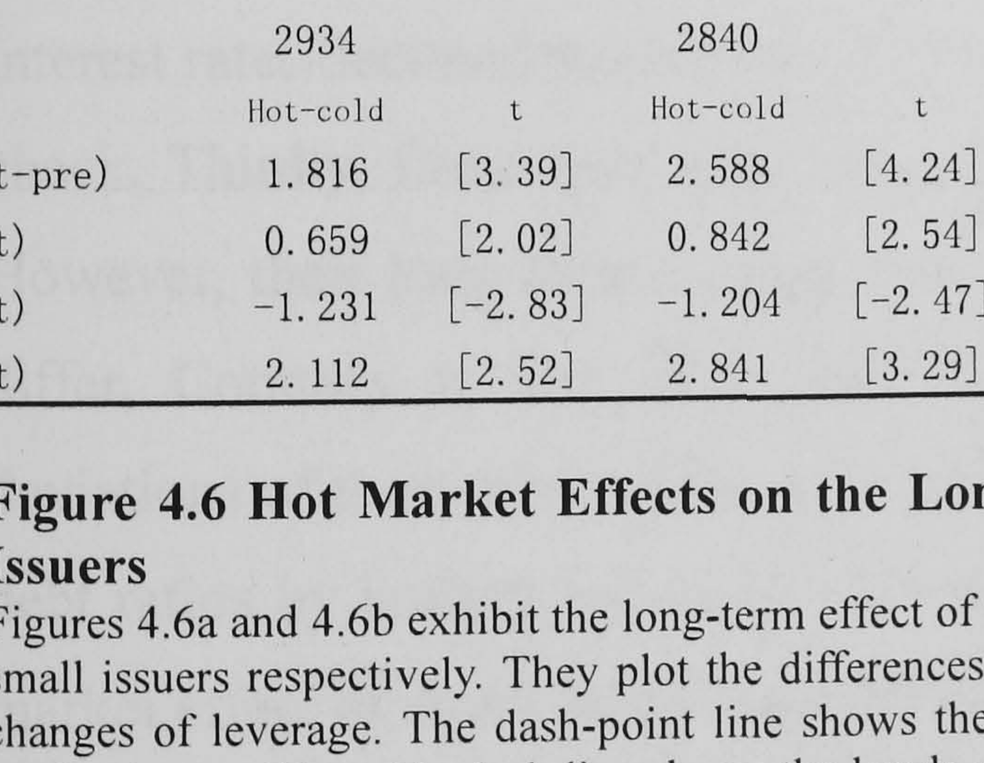


Figure 4.6a

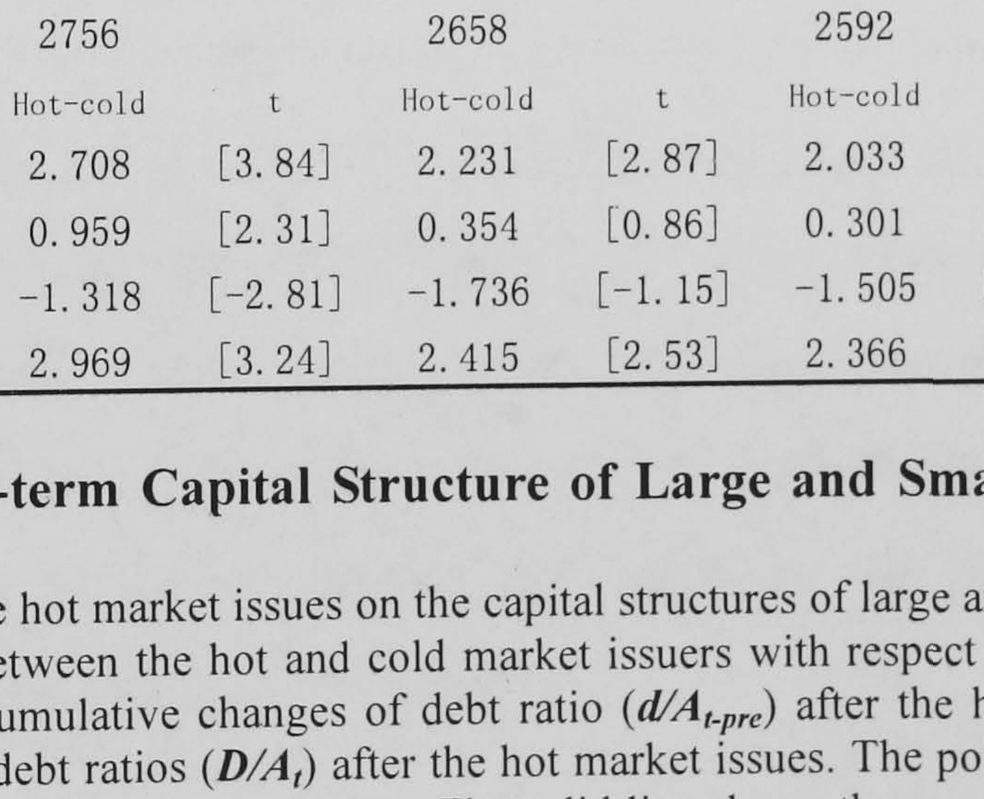


Figure 4.6b

4.6.4. Summary

This section has described the robustness checks that were conducted on the hot market effect by using alternative measures of the hot market, dividing the sample period at the market structural break, and classifying the debt issues by size. The results are generally consistent with the previous findings in terms of both the short-term impact of the timing debt issue volume and its long-term effect on the issuer's capital structure. Firstly, regardless of which benchmarks are used for the hot and cold markets, the hotter is the debt market, the more likely firms are to time the market. Firms issue more debt in hot debt markets without better investment opportunities or profitable prospects, which therefore results in higher post-issue debt ratios. The higher debt ratios caused by the hot market effect do not disappear in five years and there is no evidence that hot market firms attempt to reverse the deviation of their capital structure. Secondly, this pattern remained consistent in different macroeconomic environments and market conditions across the debt market structural break in the early 1980s. In the post-1982 period, the timing behaviours were more drastic due to the much hotter debt market when interest rates declined substantially. This is also supportive of the results of the first check. Thirdly, firms time debt issue volumes for both large and small size debt. However, their long-term strategies as regards large and small debt issues clearly differ. Contrary to the large debt issuers, who remain with the long-lasting deviations of their debt ratios, the small debt issuers attempt to reverse their higher debt ratios by issuing less debt and more equity afterwards, and therefore the hot market effect of small issues vanishes within two to four years.

4.7. Conclusion

The existing literature documents that firms are timing the capital market when raising new funds, and therefore their financing decisions are to a large extent determined by market conditions. On the other hand, a hot capital market with a high issue volume is formed as a result of the consistent understanding of firm managers regarding the desirable market conditions. This chapter has revealed the pattern of corporate debt issues in the hot market and its short and long-term influence on firms' capital structures. This notion contains three aspects. Firstly, do managers regard the hot market as a window of opportunity to time the market, or put differently, do hot markets capture firms' attempts at debt market timing? Whereas previous studies have documented evidence of debt market timing, the market condition factors commonly used, such as interest rates, term structures or inflation rates, only reflect part of the market environment. Moreover, there are complex economic links among these factors *per se*. The mechanisms used by firms when measuring market conditions and making financing decisions is not yet fully understood, and therefore the hot market is the better measure for reflecting the opinion of the majority of issuers regarding market conditions. Therefore, it has been the key issue throughout this chapter. Secondly, how do firms time the market when issuing debt? Firms raise debt funds for the basic reason of financing investment projects. Provided that their financing decisions involve the intention of market timing, there will be essential changes in various aspects of their debt issue decisions. While many previous studies have examined market timing by looking at debt maturity or yield type, this chapter has focused on whether managerial timing intention involves the abnormal changes in issue volume. Thirdly, the further question then arises as to what extent debt market timing influences firms' capital structure and financing policy afterwards. In contrast to cold market issuers, if firms time the market by issuing more debt when the market is hot, it is inevitable that they will confront the essential variations in capital structure and the corresponding consequences for other firm characteristics. An investigation of how

firms adopt financing policies and adjust capital structures is important because it reveals the theory of capital structure with the market timing factor involved. This chapter has examined each of the above questions in turn.

The main findings are as follows. Firstly, firms issue significantly more debt in the hot market than in the cold market. The evidence shows that the percentage of hot debt issues over total assets of issuers was higher than that of cold debt issues. When comparing the hot and cold market firms, it was found that they did not differ in their pre-issue debt ratios or post-issue profitability. Therefore there is no evidence that hot market firms raise more debt for reasons of large debt capacity or good investment opportunities. Conversely, the investment ratio of the hot market firms was significantly lower in the post-issue period, which does not support the notion that hot market firms grow faster. As a result of the hot market effect, the firms' post-issue debt ratio was significantly higher than that of the cold market firms. Secondly, in contradiction of the trade-off theory of capital structure, the hot market firms did not attempt to reverse their high leverage resulting from hot debt market timing by issuing less debt and more equity. As a result, the cumulative changes in the debt ratio did not disappear in the five years after the hot debt issues. It can therefore be said that debt market timing in hot markets has a long-term influence on capital structure. Thirdly, the hot market effect remained significant even as the aggregate level of the debt issue volume increased, regardless of the benchmark of the hot market. Moreover, the short-term impact and the long-term persistence of the hot market effect were robust within and between regimes. This pattern was consistent for the periods before and after the debt market structure shift in the early 1980s. However, it was found that the debt issuers treated the deviation of capital structure resulting from the hot market effect in different ways. The hot market effect lasted in the long term for the large-size debt issues but disappeared quickly for the small-size debt.

There is more to this than is at first apparent. Several implications can be drawn

from the empirical results which deserve further discussion. Above all, the hot market effect captures the attempts of firms' market timing since the hot-cold dummy variable is entirely orthogonal and has almost no relationship with the other control variables of firm-specific characteristics in determining the firms' capital structures. However, the underlying connection between the hot market and managerial market timing is not clear. Is the hot debt market the consequence or the cause of firms' market timing? Some clues can be gleaned from the comparison between the new issue markets of stock and debt. As first documented by Ibbotson et al. (1975)[87], the IPO underpricing phenomenon is always followed by heavy issue markets which then give way to periods of poor performance and light issue volume. "In 1971 there were 391 offerings with high average initial returns, followed by 562 offerings in 1972 with moderate returns, which in turn were followed by 105 offerings in 1973 with negative returns. In the mid-1970s, there were very few offerings…" (Ibbotson et al. (1988), p.37). As regards the debt issue market, the data cited here concerns the debt issuances and interest rates for the period of the early 1980s when the debt market experienced a structural break. When the ten-year Treasury bond yield increased from 11.46 to 13.91 in 1981, the debt issue number decreased from 323 to 279. In 1982, the yield declined to 13.00 and the deal number of debt issues increased to 306. Similarly, it can be seen that there was a clear tendency for the debt issue volumes to closely follow the contemporary variations in the market interest rates afterwards[88]. All these data show a tendency that there are obviously the waves of capital issuance following up the variations of market valuation. However, only the minority of firms actually capture the "timing", no matter they are really more "sophisticated" and then more capable to time the markets or they are simply lucky. In contrast to the pattern of the hot equity market, the debt market information was less asymmetric as between issuers and outside investors, and there remained few arbitrage opportunities for

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[87] Other relevant studies include Ritter (1984, 1991), Ibbotson et al (1988, 1994), Loughran et al. (1995), Eckbo et al. (2000).

[88] See the data in Table 2.1 of Chapter 2. Meanwhile, Chapter 2 documents that firm managers simply respond to the market movements rather than predict the future market conditions.

firm managers, including those with "sharp insight", to time the market. Therefore the managers who did not possess informational advantages, largely, tended to passively follow rather than accurately predict the market conditions. While rich literature reveals the cycles of issue waves and the market-wide "herd effect", the phenomenon does not appear to change, even if the benefits from market timing prove to be very little at best. The "herd effect" is consistent with the hypothesis of irrational managers suggested by Baker and Wurgler (2004), while the irrational manager approach, which departs further from theories of rational expectation and utility maximization, changes almost every aspect of corporate finance.

There remain some questions which still cannot be explained with the irrational manager approach. The evidence shows that the hot market firms issued more debt in the hot markets and continued to issue debt rather than equity afterwards. If the short-term effect of hot market issues can be explained by managerial optimism and overconfidence, the long-term persistence of the hot market effect implies that managers believe their firms benefit from their judgment regarding market conditions and the implementations of their financing decisions. Since debt market timing *per se* cannot explain this, a potential explanation is that it is not an independent phenomenon. Rather, it is related to contemporary variations in the equity market environment. Specifically, hot debt markets result from the depression of the equity market when debt market conditions are more desirable. This suggests that a study of market timing ought to be an investigation of economy that jointly involves both the equity and debt markets. On the other hand, studies examining the firms' debt-equity choices should involve the market timing effect rather than focusing on firm-specific characteristics only.

Another important issue highlighted by the empirical results in this chapter is the profound implication of capital structure theory. Traditional theories of capital structure, such as trade-off theory and pecking order theory, have been developed from the perspective of firms *per se* with no consideration given to the effects of

behavioural factors and psychological motivations. The market timing hypothesis plays an important role in firms' financing decisions. Baker and Wurgler (2002) found statistically significant indicators of the pecking order and market timing theories. However, it is preferable to regard it as an affiliated factor involved in the existing theories, referred to as the *market-oriented pecking order theory*. Firms treat the hot market (in this chapter, the debt market) as the place to raise low cost capital. In line with the survey by Graham and Harvey (2001) which recorded that more than 70% of managers admitted that they were actively timing the market, this chapter has documented that the market-oriented pecking order theory is dominant in firms' financing decisions and persistently effects firms' capital structures in the long term. However, the empirical evidence regarding the market timing effect on capital structure is not consistent. For instance, Alti (2006) found that the equity market timing for IPOs has only a short-term effect on firms' capital structures and a clear reversal of leverage occurred soon after the hot issues of IPOs and is largely consistent with the existence of leverage targets; the same pattern can be seen with small-size hot debt issues in this study. It is uncertain as yet as to whether this divergence of results is due to different capital markets or different firm-specific financial characteristics. "Literature has never provided a universal theory for corporate capital structure and there is no reason to expect one" (Myer (2001), p.81), while the market timing hypothesis may either create an entirely new theory or introduce a solution to bridge the existing gap. After all, market timing does by any means open a window on the growing field of behavioural corporate finance where managerial behaviours are critically considered.

Chapter 5: Conclusions

5.1. The purposes of the thesis

Market timing in corporate financing policies has drawn a substantial amount of attention from financial researchers. However, the scattered empirical evidence fails to form an integrated framework subject to divergent understandings regarding market timing.

Firstly, the extent to which timing the market comprehensively affects firms' financial decisions has not yet been realized. Firms are found to time debt-equity choices (e.g. Baker and Wurgler (2000)), IPOs/SEOs (e.g. Lerner (1994), Gompers and Lerner (2003), Alti (2006), and Opler and Titman (2001)), debt issuance (e.g. Marsh (1982), Barclay and Smith (1995)) and debt maturity (e.g. Baker et al. (2003)), while market timing in other aspects of financial decisions needs to be further examined. These works will help understand the prior position and the comprehensive applications of market timing in corporate financial decisions.

Secondly, there is no consensus on how firm managers time the market and whether firms benefit from the managerial market timing, especially in a relatively open and transparent debt market. The focus of contradiction lies on the different understandings on the forms of market timing. The difference between passive responses to the past information and successful predictions on the future variations of markets exists as the main gap in the literature. Therefore, an examination of the above two forms of market timing clarifies the underlying essence of managerial market timing and bridges the two sides of the contradiction.

Thirdly, market timing plays a crucial role in corporate financing decisions, and therefore inevitably affects the financial characteristics of firms. This is especially important on the traditional capital structure theories. In the circumstance that the intention of market timing determines corporate financing decisions, to what extent

that the factor of market timing distorts the capital structure of firms and how persistently the influences last are open to question. Moreover, it is expectative that the issue of market timing provides a potential explanation on the traditional capital structure theories.

Focusing on corporate debt issuance, the present thesis is dedicated to filling the above gaps in the literature regarding market timing.

5.2. Empirical strategies, results and implications

The present thesis contributes to the growing field of market timing with respect to corporate debt issuance, from underlying motivations, to implementation mechanisms, to consequences. Briefly, the findings are as follows. In contrast to hedging interest rate exposure, the primary motivation for corporate debt issuance is timing the market to reduce the costs of capital. However, debt market timing is generally unsuccessful. Even so, timing the market tends to be a long-term financing strategy.

Chapter 2 of the thesis examines the intention of timing the market in the decisions of corporate debt issuance, in contrast to the consideration of hedging interest rate exposure. The fundamental question is whether firms take advantage of debt issuance to hedge risk exposure or time the market to reduce capital costs. This is based on the assumption that corporate debt is an effective instrument of interest rate risk management. This chapter describes the development of a factor model for examining the determinants of debt issuance as regards the motivations of hedging interest rate exposure and market timing. First of all, the interest rate exposures were measured before and after the corporate debt issues. Although the risk management theory indicates the basic hedging function of liabilities, corporate debt is not employed as an instrument of hedging interest rate exposure. Conversely, it has been found in this chapter that a firm's overall interest rate exposure significantly increases after debt issuance. Moreover, consistent with

previous empirical evidence regarding market timing, debt maturity and yield type choices were found to be significantly correlated to the debt market condition variables. Furthermore, when examining the determinants of corporate debt issuance by using multivariate tests, the evidence shows that timing the debt market rather than hedging the interest rate exposure is the primary motivation when firms choose yield types and maturities for their newly issued debt. Market timing in firms' financing policies actually reflects the speculation intention of reducing capital costs. The underlying implication is that the practical implementations of corporate risk management are due to the motivation of firm value maximization rather than volatility minimization. It suggests that only downside risk exposure would be hedged, while managers tend to selectively make use of upside volatility to add firm value if they believe there is a window of opportunity to speculate. These findings bridge the gap between the initial risk management theory of immunization and its practical implementation in non-financial firms' interest rate risk management. Moreover, corresponding to previous studies, this chapter adds evidence to the sum of knowledge regarding debt market timing with respect to both maturity and yield types choice.

Extending from the empirical evidence of debt market timing and the corresponding critical arguments, *Chapter 3* examines how firm managers time the debt market. On the one hand, the co-variations between debt market variables and corporate debt issuance exhibit a significant correlation and mutual tendency. On the other hand, it is suspected that this evidence implies only a spurious relationship due to the plausible timing ability of managers. It is assumed that firm managers realize the market fluctuations and then make financing decisions based on their predictions to beat future market variations. The previous empirical evidence identified managers' timing behaviour in the former stage, explained as *trying* to time the market, while the arguments emphasized the results in the latter stage, explained as *successfully* time the market. Therefore, an underlying gap exists between the attempts and successes of managerial debt market timing.

Distinguishing passive responses to current market fluctuations from successful predictions of future market movements clarifies the definition of market timing. In this chapter, these two different forms of debt market timing, referred to as *forward market timing* and *backward market timing*, are examined respectively. The results are consistent with both sides of the argument. On the one hand, no significant differences are seen in debt issue volume or maturity before interest rates rise and decline. Thus, firms are not issuing more debt (or long-term debt) before the costs of debt (long-term debt) issues increase. On the other hand, debt issue volume and maturity are correlated to the relative interest rates compared to their historical levels. These findings essentially explain the existence of debt timing behaviours as well as the plausible informational advantages of firm managers. In the light of these findings, the previous fractional and mixed evidence of debt market timing have been associated together. In brief, the results in *Chapter 3* suggest that managers are generally unsuccessful in timing future debt markets, while their timing decisions on debt issues are simply responses to past market information.

Now that debt market timing is prevalent in corporate financing policies, it is inevitable that it will affect firms' financial characteristics, especially capital structure. *Chapter 4* examines the influences of debt market timing on firms' capital structure in both the short and long term, and provides a potential explanation to the traditional capital structure theories. The hypothesis is that firms regard the hot debt market as signalling low costs of debt issuance, and so tend to time the market by issuing more debt. Defined by the cumulative issue volume of corporate debt, a hot market dummy variable is introduced as the indicator to distinguish debt issues in the hot and cold markets. The findings in this chapter are remarkable. By comparing the features of hot and cold market debt issues with the involvement of various firm-specific financial characteristics, the results show that the percentage of hot market debt over total assets of issuers is significantly higher than that of cold market debt. More importantly, the higher ratio of hot market debt cannot be explained by firm-specific financial characteristics, such as a low

leverage ratio, growth opportunities, or profitability. Moreover, the post-issue investment ratios of hot market issuers are lower than the corresponding ratios of cold market issuers. Therefore, these results are consistent with the hypothesis, that is, firms issue more debt than is necessary for their minimum capital requirements when the debt market is hot. On further examination of the long-term influence of the hot market effect, the higher post-issue debt ratios of the hot market issuers persisted for the long term. In contradiction of the trade-off theory, it was not found that hot market firms attempt to reverse the deviation of capital structures resulting from debt market timing. Collectively, hot debt markets capture the timing behaviour involved in corporate debt issuance. Moreover, the capital structure deviations resulting from debt market timing are persistent in the long term. The evidence suggests that managers view hot debt markets as the windows of opportunity to reduce the costs of capital. Therefore, market timing plays an important role in financing activities by shaping the firm's capital structure in the long term, which sheds light on the capital structure theory coupled with the behavioural factor.

The present thesis not only reviews the previous evidence regarding debt market timing, but also comprehensively examines various aspects of debt market timing, including maturity, yield and issue volume. As a whole, it suggests that the concerns of market timing play a part in every aspect of corporate financing decisions. Moreover, consistent with the findings of previous survey studies, managerial timing behaviours are found to be prevalent across firms with different characteristics, which raises market timing to a common factor of corporate finance. Another important contribution of the present thesis is that it integrates previous fractional evidence regarding market timing and bridges the gap between behavioural finance and the efficient market hypothesis. Distinguishing passive responses from successful predictions explains the existence of managers' timing attempts as well as the general efficiency of capital markets. Therefore, all the evidence has been linked together through the clarification of the market timing

definition. Further, by identifying the long-term influence on firms' financing policies, this thesis raises the market timing theory as another explanation for the formation of capital structures. The prevalent existence of market timing behaviour suggests that it is necessary to rethink the effects and influences of market timing as a common factor in every corporate financial activity. In revealing the timing issue in traditional capital structure theories, this thesis is no doubt one of the earliest studies in this area.

5.3. Limitations and further researches

Inevitably, the present thesis contains some limitations which will provide the motivation for future research. In Chapter 2, the research question is based on the immunization theory that firms may be able to immunize their firm value against changes in interest rates to some degree by matching the interest rate sensitivity of their assets and liabilities through active interest rate risk management. However, since the future cash flows of non-financial firms cannot be exactly known in advance and since the economic life of most of their assets is undermined, an accurate calculation for duration appears difficult as regards these firms. Even if firm managers indeed targeted in order to hedge interest rate exposure when issuing debt, they would still need an executable instruction for designing a debt duration structure to effectively eliminate the overall interest rate exposure of assets and cash flows. The lack of this executable strategy also explains why managers do not attempt to utilize this widely accepted theory in their practical implementation of risk management. Although in this chapter it is empirically reasonable to use stock price interest rate sensitivity to measure the interest rate exposure of firm values, this issue of how to predict and hedge future risk exposure has not been further pursued here. This is a gap to be bridged by further research with respect to corporate interest rate risk management, while the main obstacles would be the measurement of asset interest rate sensitivity, the linkage of variables measuring the interest rate exposure of assets and liabilities, and the dynamic

adjustment strategy corresponding to risk exposure volatility.

In this thesis, empirical evidence is found that managers time the debt market based on the historical public information, while their predictions on future market variations are generally unsuccessful. However, this finding does not suggest that managers make decisions according only to past information. Financial markets are essentially a game played between firms and investors about the market information. As a matter of fact, survey studies have indicated that managers admit that their financing decisions include their views of future markets. Unfortunately, these survey studies shed no light on the methods or the benchmarks of estimation used for the future market movements. There is still a puzzle regarding the fundamental explanation of managerial market timing. On the one hand, timing behaviours exist generally although the benefits are at best very small. The irrational manager hypothesis answers many questions but cannot explain itself convincingly. On the other hand, financial researchers and practitioners have never stopped looking for arbitrary opportunities to beat the market, as evidence regarding market anomalies does not support a perfect efficiency of capital market. Although no essential progress has been seen in this direction yet, there is still the possibility of managers' superior ability on detecting the market anomalies. Therefore, it is important to judge whether managers are wholly irrational or whether some of them do possess informational advantages and "sharp insight". This issue has not been investigated further in this thesis. There is no doubt much work to be done in the area of the behavioural finance. However, the rationality and co-reaction of both firm managers and capital markets will continue to be the focus of corporate financial researches.

Another limitation of this thesis is that it focuses only on the debt market *per se* and does not involve the correlations between the debt market and other capital markets such as the equity or derivative markets. As there are still some questions which cannot be explained regarding the regime of debt market timing, such as

consistent debt market timing, it is suggestive that there may be the underlying influence of contemporary equity market variations. As indicated by Baker et al. (2004), "one intriguing pattern that has been uncovered is that debt issues are followed by low equity returns (p.25)", their empirical evidence shows that the debt market and other capital markets are not independent. Hot debt markets may result from the depression of the equity market which causes the debt market to be more desirable. The low returns of overvalued equity markets, on the one hand, reduce the cost of debt directly, on the other hand they release the leverage constraint and so enlarge the debt capacity. Apart from issuing overvalued equity, firms also have incentives to issue low-cost debt instead, while their debt-equity choice has to be a joint investigation involving both equity market timing and debt market timing as a whole. This seems like a promising direction for future research.

In addition, a potential limitation of the present thesis is the use of data from different markets for different chapters. The UK and the US markets represent two major markets of the world and both are the developed and mature markets. It is also reasonable to assume that these two markets have similar and comparable features. Moreover, the objectives of different empirical chapters are independent of each other and are developed from previous literature. Chapter 2 extends the findings in Faulkender (2005) which is based on the chemical industry in the US. An investigation of the entire UK market not only reveals the market-wide market timing behaviour on corporate debt issue decisions, but more importantly, also explores the prevalent tendency of market timing across markets. By contrast, Chapter 3 and Chapter 4 focus on market timing in the US. Further examination of the issues by employing different methodology but focusing on the same market and a similar database is suggested. In this sense, the different focuses across financial markets are reasonable. Moreover, the conclusions in individual empirical chapter do not entirely rely on those from the other chapters. Therefore, this potential limitation does not change the convincing conclusions that market timing

has comprehensive influences on firms' financing decisions. However, it will be reasonable to further examine timing issues in a sole market entirely as well as the different features across markets.

The present thesis examines the phenomenon of managerial market timing in corporate debt issuance. It reveals that managers try to issue corporate debt when the market conditions suggest a low cost of capital, when they have misguided notions that they possess superior information about the market variations. It is assumed that managers make financial decisions in morality and justice to maximize shareholders' value instead of their own interests. However, literature regarding behavioural finance shows that this assumption may not hold in reality. It has been known that the changes in managerial ownerships distort the style of risk management. Managers are more likely to time the market when they realize a favourable outcome because of a risky strategy. With the same logic, tenures, compensation contracts and ages may all potentially affect managerial behaviour in decision-making, including market timing. The present thesis does not go further in the direction of managers' incentives based on their personal interests. Treating managers as normal persons instead of entirely rational financial experts, future research regarding the role of managerial ownership, tenure or other factors of personal interests on market timing is expected to be a fruitful dimension.

There is clearly much work to be done before the market timing theory reaches maturity. In an effort to stimulate such interest, this thesis closes by highlighting a few further research questions. Market timing reflects the financial decisions and activities of firm managers corresponding to the market environment and their judgments on the future market variations. This poses the question as to whether the variation of debt market conditions is predictable. Furthermore, how do managers estimate the market conditions? Despite the usual challenges of measuring mispricing, the growing field of behavioural corporate finance suggests an increasing popularity of a stylised manner of making managerial decisions. Do

firms successfully time the debt market by using a stylised manner of financing? How does the market (investors) react to the corporate financial decisions in specific market circumstances? What are the influences of managers' market views on firms' financial characteristics and performance? As a developmental direction in corporate finance, these fundamental questions with respect to the behavioural factor of market timing should also be examined as regards other financial activities, such as takeovers, IPOs, repurchasing, and dividend payout, etc. As a matter of fact, almost all corporate financial activities involve managers' views of the market. The present thesis cannot be expected to solve or even raise all the relevant questions. However, it has pointed out a promising direction for the development of corporate finance.

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